The University of Nottingham

A Longitudinal Study of Academic Self-Concept in a Streamed Setting: Home Environment and Classroom Climate Factors

by

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Abstract

The effect of streaming on students' academic self-concept and their perceptions of home environment and classroom climate was examined in a 3-year longitudinal study of a single cohort in Singapore. The subjects were 495 Secondary 1 (average age 13) students, who were streamed based on their Primary School Leaving Examination results taken at the end of Primary 6 (average age 12). The study was conducted with the use of a self-constructed questionnaire on four occasions at approximately 1-year intervals. The measures included the academic self-concept scale, made up of the students' confidence and students' effort subscales, the home environment scale, made up of the relationship with parents and academic support subscales, and the classroom climate scale, made up of the relationship with teachers, teachers' expectations and peer relationship subscales. The results revealed that the students' academic self-concept, and their perceptions of home environment and classroom climate largely declined from Secondary 1 to Secondary 3, and the declines were more pronounced for the higher-ability stream students than the lower-ability stream students. In addition, the lower-ability stream students' academic self-concept and their perception of classroom climate were more negative than those of their higher-ability stream counterparts immediately after streaming. Nonetheless, they were comparable if not more positive than those of their higher-ability stream counterparts three years after being streamed. Furthermore, regression analyses revealed that perceived teachers' expectations, relationship with teachers, relationship with parents and parental academic support were main predictors of students' academic self-concept. However, parental academic support tended to affect higher-ability stream students' academic self-concept more than that of their lower-ability stream counterparts, whilst teachers' expectations tended to affect the lower-ability stream students' confidence level more than that of their higher-ability stream counterparts.

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Chapter One

The Singapore Context:

The General Problem

1.1 Introduction

Traditionally, education has focused on the cognitive and instructional aspects of teaching and learning because they are intimately related to educational performance. During the last two decades, however, there has been a growing consensus that

> '... education is not just about learning cognitive skills. It is also about helping children to learn about themselves, to be able to live peacefully with themselves, and with others, and to help them to develop into competent, mature, self-motivated adults.' (Lawrence, 1988, p. x)

To achieve the objective of educating the whole person, in addition to accentuating formal institutionalised teaching and learning, there is clearly a need to emphasise the affective aspects of education as well. In particular, psychologists and educators have realised that an individual's self-concept, or one's attitudes to and perceptions of oneself, is inseparable from one's sense of well-being, and from how one learns and behaves (Burns, 1982). This appreciation has led to the improvement of an individual's self-concept being valued as an outcome in its own right (Burns, 1982). It has also established self-concept as an important construct for interpreting an individual's behaviour and educational performance (Burns, 1982).

The aforementioned development has resulted in a sharp increase in studies on students' self-concept. For instance, a substantial amount of work has been carried out on changes in students' self-concept during adolescence (Lau, 1990; Marsh, 1989; Marsh, Parker & Barnes, 1985). Several studies have also focused on the impact of home and/or school on students' self-concept (Lau & Leung, 1992; Mboya, 1995; Sanders, 1996; Wentzel, 1997). Nonetheless, not much work has been done in streamed settings, either in studying changes in students' self-concept during adolescence, or in examining higher- and lower-ability stream students' self-concept and their perceptions of home and classroom environments. To bridge this empirical gap, this study aims to explore the changes in students' academic self-concept, and their perceptions of home environment and classroom climate over a 3-year period in Singapore. It also seeks to ascertain whether there is any difference between ability streams in the three areas of interest.

Broadly, the study will cover developmental changes in students' academic self-concept, and their perceptions of home environment and classroom climate of the overall sample and different subgroups of students from early to middle adolescence. The subgroups will include male and female students, higher- and lower-ability stream students, and marginal higher- and marginal lower-ability stream students. In addition, the study will look at the three areas of interest in terms of subgroup comparisons by gender, ability stream and marginal ability stream. It will also examine the relationships between students' academic self-concept and their perceived home environment and classroom climate, and will strive to determine whether these relationships are comparable by gender, ability stream and marginal ability stream. Furthermore, it will explore whether perceived home environment and classroom climate are significant predictors of students' academic self-concept, and if they are, whether their contributions are similar for different subgroups of students. Finally, the study will focus on heterogeneous groups of students with (a) different academic abilities and aptitudes, and (b) different self-perceptions of academic self-concept, home environment and classroom climate.

For convenience, a list of abbreviations and short-forms used in this study is given in Appendix 1 (p. 409).

1.2 Background of the Study: The Singapore Education System

'The Report on the Ministry of Education' (Ministry of Education, MOE, 1978) highlighted high dropout rates for both primary and secondary school students in Singapore. It also established high failure rates for the Primary School Leaving Examination (PSLE), and the Singapore-Cambridge General Certificate of Education 'Ordinary' level examination (GCE 'O' level examination). To redress the situation, the MOE accepted the recommendation of the report, and incorporated flexibility in the education system so that students were allowed to progress at their own pace and were given adequate time to complete their primary and secondary education. Thus, the New Education System Primary Level, and the New Education System Secondary Level were introduced in January 1980 and 1981 respectively. At the secondary level, the new system implemented streaming of students into Special, Express and Normal courses. In 1994, with the abolition of years 7 and 8 levels in the primary education system (Primary 7 and 8), and the upgrading of vocational and industrial training to post-secondary education, a new Normal Technical course was introduced. The new course was different from the Normal course implemented in 1981 (renamed the Normal Academic course), and it aimed to cater to the needs of more technically inclined students (The Straits Times, 21 August 1993).

Under the modified system, all students sit for the PSLE at the end of year 6 in the primary level (Primary 6), whereas in the old system, some students sat for the PSLE at the end of year 8 in the primary level (Primary 8). The PSLE is a national examination and the result is the criterion used to assess a student's ability and aptitude for secondary education. Among the students who passed the PSLE, those who are within the top 10% can choose to enrol in the Special course. Other students are placed in the Express (about 50%), Normal Academic (about 25%), or Normal Technical (about 15%) course. Although students are streamed based on the PSLE result, there is provision for transfer between streams. Thus, students who perform well can be channelled into a more demanding stream, and students who cannot cope can be transferred to a less demanding stream. These transitions take place generally in the first two years of the secondary level.

The Special and Express courses are both 4-year courses leading to the GCE 'O' level examination. Students in the Special course (Special students) study two first languages, that is, English and either Higher Chinese, Higher Malay, or Higher Tamil, in addition to other subjects. Students in the Express course (Express students), however, study English as the first language, and their mother tongue, that is, Chinese, Malay or Tamil, as the second language.

The Normal Academic and Normal Technical courses are both 4-year courses leading to the Singapore-Cambridge General Certificate of Education 'Normal' level examination (GCE 'N' level examination). For some students, the examination is the terminal point of their secondary education and they leave school for employment or vocational training. However, other students can choose to proceed to year 5 in the secondary level (Secondary 5), where they prepare for the GCE 'O' level examination at the end of the year. Students in the Normal Academic course (Normal Academic students) need to obtain an aggregate of less than 11 points for the best three subjects and a pass in English in their GCE 'N' level examination (Academic) to be given the choice to proceed to Secondary 5. Students in the Normal Technical course (Normal Technical students) need to obtain Grade 1 for both English and Mathematics, and at least a Grade 3 in a third subject in their GCE

'N' level examination (Technical) to be given the choice. Similar to the Express students, Normal Academic students study English as the first language, and their mother tongue, that is, Chinese, Malay or Tamil, as the second language. Normal Technical students, however, study English as the first language, and their mother tongue at the basic level (oral/aural competence and reading comprehension).

Special, Express and Normal Academic students are taught a common curriculum at the lower secondary levels (year 1 and 2 in the secondary level, or Secondary 1 and 2). It comprises of English, the appropriate mother tongue, mathematics, general science, literature, history, geography, art and craft, and home economics or design and technology as examination subjects, and civics and moral education, music, and physical education as non-examination subjects. Students in the top 10% of the PSLE cohort who are competent in languages and other subjects may take up a third language, such as German, French, Japanese or Malay. At the upper secondary levels (year 3, 4 and 5 in the secondary level, or Secondary 3, 4 and 5), students are offered a core curriculum that includes both languages, mathematics and an additional two to six subjects. The additional subjects for Special and Express students comprise of a science, a humanities and up to four electives. The electives available are usually literature, history, geography, additional mathematics, physics, chemistry, biology or combined science. Students who are talented in art and music can also choose the subjects as electives under the Art and Music Elective programmes if they meet the selection criteria. The additional subjects for Normal Academic students comprise of two to four electives. The electives available are typically subjects in humanities, sciences and practical subjects, such as food and nutrition, fashion and fabrics, design and technology, principles of accounts and commerce. In addition to the aforementioned subjects, civics and moral education, music and physical education are taught as non-examination subjects.

Normal Technical students follow a different core curriculum from students in the other courses. At the lower secondary level, they are taught a common curriculum comprising of English, mother tongue at basic level, mathematics, computer applications, science, technical studies and home economics as examination subjects, as well as social studies, art and craft, civics and moral education, and physical education as non-examination subjects. At the upper secondary level, they are offered English, mother tongue at basic level, mathematics and computer applications as core subjects, and up to three electives. The electives available are technical studies, science, food and nutrition, fashion and fabrics, art and crafts, and elements of office administration. In addition, civics and moral education, music and physical education are taught as non-examination subjects.

The Normal Technical course was introduced a year before the start of this study. Because the implementation of the course was not well defined at that stage, it was excluded from the present study. As such, all references herein to Normal students refer to Normal Academic students, unless otherwise stated.

Considering that students may have different strengths, needs and different capacities to learn, streaming students into courses in which they are taught at a pace and level best suited to their learning abilities appears educationally sound. In fact, empirical evidence suggests that streaming is effective in reducing attrition rates and in increasing the percentage of students completing secondary education in Singapore. Specifically, streaming reduced the percentage of premature school leavers in primary and secondary cohorts from 11% and 19% respectively in 1980, to 0.4% and 4.4% respectively in 1997 (The Straits Times, 7 September 1998). In addition, it increased the percentage of students completing secondary education at 'N' or 'O' level from less than 40% to 75% (The Straits Times, 25 September 1987).

1.3 Statement of Problem

The former Singapore Minister of Education, Dr. Tony Tan, in his letter to the principals in the study team (MOE, 1987) asserted that:

> 'There are few things which are of greater concern for the Singaporean than to ensure that his children are adequately prepared to face the future with confidence'.

His sentiment was recently reiterated by Mr. Wee Heng Tin, Singapore Director-General of Education, when he outlined the desired outcomes of education (MOE, 1998b). Specifically, he accentuated the fact that 'education is about nurturing the whole person' (p. 1), and that formal education should prepare students 'to think, reason and deal confidently with the future, with courage and conviction in facing adversity' (p. 4). The desired outcome of schooling, or education in the broader sense, cannot be reached merely by underlining the importance of cognitive skills and academic performance. To achieve its aim, Singapore needs to look into the affective outcomes of education. In particular, the MOE, working in tandem with schools, has to ensure that students cultivate positive self-concept during their schooling days and that their healthy self-concept is sustained into their working life. Although the desired outcome can be facilitated by the implementation of a pastoral care programme in schools, and by encouraging schools to create supportive environments, it will not be attainable if students' self-concept has been impaired by the streaming policy.

Following the implementation of the New Education System Secondary Level almost two decades ago, the MOE has provided evidence of declined attrition rates and increased percentage of students completing secondary education to support the cognitive outcomes of streaming (see Section 1.2). However, no data have been collected concerning the effect of streaming on students' affective domains. Opponents of streaming have contended that channelling students into lower-ability streams may lead to stigmatisation that evokes in students lower expectations for both achievements and behaviour (Slavin, 1988). In contrast, proponents of streaming have asserted that by virtue of social comparison (Festinger, 1954), the absence of bright students in class gives less academically inclined students a chance not to be reminded of their inadequacies. Thus, lower-ability stream students would have comparable if not higher self-confidence and self-concept than higher-ability stream students. In the light of this ongoing debate, it is possible that the streaming policy can have an effect on students' academic self-concept, and Singapore's chance of achieving its educational aims.

Generally, parents place great emphasis on academic success (Burns, 1982), so their immediate reaction may be disappointment or anger if their children are channelled into lower-ability streams.. However, being in a lower-ability stream may allow these children a chance of experiencing success in their more homogeneous classes. Hence, parental attitudes may become more positive when they realise that their children are able to compare favourably with their peers. In this view, it is plausible that the streaming outcome may also affect parent-adolescent relationships and changes in these relationships over time.

In the school context, anecdotal evidence from teachers suggests that Normal students are less motivated to study and more prone to discipline problems than Express students. At the same time, Normal students have also been heard complaining that their teachers do not show enough care and concern for them. Some of them have also bemoaned that their schoolmates in the Express stream look down on them. Although the comments may come from a few teachers and students, they suggest that the classroom climate of Normal stream classes may be less favourable than that of Express stream classes. Nevertheless, in the absence of empirical data, we cannot discount the possibility that the comments from Normal students may have been prompted by predisposed negative attitudes towards their teachers and classmates. In this case, their less enthusiastic attitudes may have been the cause of teachers' complaints. Based on the contention, it is conceivable that the streaming policy may also have an effect on students' perception of classroom climate.

Considering that streaming may have an impact on students' academic self-concept and their perceived social environments, it is problematic that so few studies have examined the issue in the Singapore context, especially from a longitudinal perspective. Thus, this study will explore developmental changes in secondary school students' academic self-concept, and their perceptions of home environment and classroom climate over a 3-year period in Singapore. To have a clear picture, it will examine the changes over time of the overall sample, male and female students, Express and Normal students, and Lower Express and Higher Normal students. The study will also carry out subgroup comparisons by gender, ability stream and marginal ability stream to establish whether there is any difference between the subgroups in their academic self-concept, and their perceived home environment and classroom climate at each point in time, and their developmental changes over time.

According to the symbolic interactionists (Cooley, 1912; Mead, 1934), an individual's sense of self is a social product of reflected appraisals of others, especially those of significant others. Since parents, teachers and peers are some of the most significant persons in students' life (Burns, 1979; Claes, 1998; Juhasz, 1989a, 1989b; Rosenberg, 1979), their experiences with them should have a substantial influence on their level of self-evaluation. Hence, it is relevant that students' self-concept is related to their perceived regard and support from their parents, teachers and peers, and the nature of their relationships with them. Although several studies (Lau & Leung, 1992; Mboya, 1995; Sanders, 1996;

Wentzel, 1997) have supported the existence of such relationships, there does not appear to be a study that has looked at all three constructs in a streamed environment. Therefore, to add insights to the issue, this study will strive to establish the relationships between students' academic self-concept and their perceived home environment and classroom climate. It will look at the relationships for the overall sample, and will seek to ascertain whether these relationships are comparable by gender, ability stream and marginal ability stream. Some researchers have contended that academic self-concept is explained principally by variables such as students' past academic achievement, socio-economic background, ability level or stream membership. This study will attempt to shed light on these claims by examining whether perceived home environment and classroom climate are significant predictors of students' academic self-concept, and if they are, whether their contributions are similar for male and female students, higher- and lower-ability stream students, and marginal higher- and marginal lower-ability stream students.

Finally, there has been concern that the study of averaged means of the overall sample or large subgroups of students may mask subtle changes in smaller subgroups of students (Hirst & DuBois, 1991). To address this concern, this study will also look at smaller, heterogeneous groups of students with (a) different academic abilities and aptitudes, and (b) different self-perceptions of academic self-concept, home environment and classroom climate. The first set of subgroups, namely, ability bands of students, will be identified with the help of the streaming criterion, and the second set of subgroups, namely, clusters of students, will be selected with the use of cluster analysis.

To summarise, the research areas of this study are academic self-concept, home environment and classroom climate. The subgroups under consideration are male and female students, Express and Normal students, Lower Express and Higher Normal students, and to a lesser extent, ability bands and clusters of students.

Chapter Two

Literature Review

This chapter is organised as follows:

2.1 Brief Discussion of Self-Concept Theories;

2.2 Definitions of Self-Concept;

2.3 Student's Self-Concept;

2.4 Students' Perception of Home Environment;

2.5 Students' Perception of School Social Climate;

2.6 Relationship between Self-Concept and Home Environment;

2.7 Relationship between Self-Concept and School Climate;

2.8 Research Questions; and

2.9 Operational Definitions.

Essentially, Sections 2.1 and 2.2 give the theoretical basis of the study, and Sections 2.3 to 2.7 provide the review of literature in areas relevant to the study.

2.1 Brief Discussion of Self-Concept Theories

The notion of self is not a recent theoretical formulation. It was explored long before psychology became an official discipline. In fact, so much work has been done that a detailed account of the theories is not possible. Thus, this section will only highlight the major theoretical approaches that are relevant to the understanding of this study. They are (a) the pioneer work, (b) the symbolic interactionism, and (c) the humanistic psychology.

(a) The pioneer work

In the pre-psychology era, self was thought to be some non-physical entity residing in a physical body. It was commonly linked with metaphysical concepts such as 'soul', 'will' and 'spirit', which restricted it to unscientific speculation in theology and philosophy (Burns, 1979).

James (1890) was one of the pioneers to claim 'self' as a psychological construct. He differentiated global self into the subject (I) and the object (Me), that is, the 'self-as-knower' and the 'self-as-known'. Following the distinction, the concept of self was available for scientific investigation and theorising. For James, the self-as-known, defined as an individual's self-concept, is 'everything that a man can call his' (Burns, 1982, p. 16). He posited that this objective self could be divided into spiritual self, material self, social self and bodily self, in descending order of importance. These four selves were thought to interact uniquely to constitute an individual's view of oneself. According to James, an individual has the freedom to set one's own goals for different components of the self, and evaluate one's own success at them. He contended that it is the position a person wishes to achieve that determines one's level of self-esteem. Consequently, to maintain a high self-esteem, an individual can choose to maximise one's success or minimise one's expectations. Notably, he asserted that 'with no attempt there can be no failure, with no failure no humiliation' (Lawrence, 1988, p. 6).

The major problem with James' formulation is the assumption that it is possible to discount all failures. However, there are some skills which society rates very highly, for example, academic competence, so despite having low expectation, to have very poor academic performance is likely to lead to low self-esteem. Notwithstanding the problem with James' contention, he contributed much to the study of self by producing a comprehensive formulation of the self-as-known that included descriptive categories, evaluations, attitudes and feeling (Burns, 1982).

(b) The symbolic interactionism

In the early twentieth century, the study of self moved temporarily away from mainstream psychology into a more sociological field led by Cooley (1912) and Mead (1934). They were the symbolic interactionists, who highlighted the importance of society for the establishment of self-concept. They posited that society, constructed out of the sum of behaviours of the people in it, places social limits on an individual's behaviour. Thus, the self and others form an inseparable unit. They assumed that the two are mutually dependent such that a full understanding of one can only be achieved via the understanding of the other (Burns, 1982).

As long ago as 1912, Cooley underlined the significance of feedback from others as an important source of information about the self. He formulated the theory of 'looking-glass self', which emphasised that one's self-concept is predominantly influenced by what one perceives of others' opinions of oneself, particularly those of one's significant others. He wrote:

> 'Each to each a looking glass, reflects
> the other that doth pass.' (p. 152)

The looking-glass self is formed out of the symbolic interaction between one and one's various primary groups. It is a reflection of imagined appraisals of one's significant others about oneself. In contrast to James' view on self-esteem being individually defined, Cooley asserted that the 'self and society are twin born...' (p. 5).

Like Cooley, Mead (1934) identified the society as the birthplace of self. However, he amplified and expanded on Cooley's view such that the looking-glass self is reflective not only of significant others, but of a generalised other, that is, one's whole social and cultural environment (Burns, 1982, p. 164). Mead contended that

> 'The individual experiences himself as such, not directly but only indirectly, from the particular standpoints of other individuals of the same social group, or from the generalised standpoint of the social group to which he belongs.' (p. 138)

The basic postulation of the symbolic interactionists is that such individual-society interaction will result in the acquisition of values, attitudes, roles and identities pertinent to one's society, and ultimately, it will give shape and meaning to one's self-conception. This school of thought has received widespread professional acceptance (Burns, 1982), and is adopted as a basic belief of this study.

(c) The humanistic psychology

The humanistic (phenomenological or perceptual) approach in psychology sought to understand an individual through 'the impressions of the subject and not through the eyes of an observer' (Burns, 1982, p. 19). The fundamental thesis was that

> 'behaviour is not only influenced by past and current experiences but by the personal meanings each individual attaches to his perception of those experiences'.
>
> (Burns, 1979, p. 30)

Particularly, Snygg and Combs (1949) were against the mechanistic view of man by the behaviourists. They posited that

> 'Man is not a puppet bandied about by the mercy of the forces exerted upon him. On the contrary, he is a creature of discretion who selects his perceptions from the world he lives in. He is not the victim of events but is capable of perceiving, interpreting, even creating events.' (p. 312)

They asserted that man is a conscious being. Thus, the way one behaves is a result of how one perceives the situation and oneself at the instance. They went further to deny the influence of the unconsciousness by stressing that 'all behaviour without exception is completely determined by and pertinent to the phenomenal field of the behaving organism' (p. 15).

In addition to Syngg and Combs, Rogers (1951, 1959) was another main proponent of the humanistic psychology. His work on client-centred therapy and analysis of interpersonal relationships made self-concept an important construct in personality and counselling theories (Thomas, 1980). It also contributed much to the present formulation of self-concept theory (Burns, 1982). Rogers defined self-concept as

> 'an organised configuration of perceptions of the self ... It is composed of such element as the perceptions of one's characteristics and abilities; the percepts and concepts of self in relation to others and to the environment; the value qualities which are perceived as associated with experiences and objects; and goals and ideals which are perceived as having positive or negative valence.' (1951, p. 136)

He posited that 'man lives essentially in his own personal and subjective world' (1959, p. 191). He is able to interpret his experiences selectively, and it is the organisation of the selective self-perceptions that made up his self-concept. According to Rogers, it is the self-concept and not any 'real' self that governs an individual's behaviour, and the perceptions of meaning the person attaches to the environment. He elaborated on his theory to propose that man has basic needs, whether learned or inherent, for positive regard from others, which develops with self-concept (Burns, 1982). He asserted that an individual's self regard (synonymous with self-esteem) is related to or contingent upon positive regard from others, which can be expressed through warmth, liking, respect, sympathy, and acceptance. In the light of Rogers' contention, educators and parents should remind themselves that their students or children have to perceive positive regard of acceptance and respect if they are to cultivate healthy self-esteem.

From the humanistic viewpoint, it is thus relevant that this study strives to obtain students' perceptions of their academic self-concept and their social environments, perhaps in the form of self-report, and not through the eyes of an observer. Assuming that 'we cannot change events but we can change our perceptions and interpretations of them' (Burns, 1982, p. 19), it is tenable that supportive home and school environments may influence students' interpretation of streaming. Perhaps students may see streaming as an opportunity for them to progress at a rate in which they can benefit most from school instructions, instead of a public acknowledge of their academic competence or lack of it.

2.2 Definitions of Self-Concept

Self-concept has many definitions throughout its historical development. To put the study in perspective, this section will look at a few definitions and underline their relevance to the study.

Rosenberg (1979) defined self-concept as thoughts about the self. Along a similar vein, Gecas (1982) defined self-concept as an individual's representation of his or her self-knowledge. Clearly, both definitions deal primarily with self-understanding (Wigfield & Karpathian, 1991).

Certain theorists like Cooley (1912) and Mead (1934), however, posited that one's self-concept is influenced not only by self-understanding but also by how others view oneself. For these theorists, social interactions form the basis for self-concept development, with one's comparison of oneself with others providing feedback about one's skills, talents and interests. In line with Cooley's and Mead's, or the symbolic interactionists' viewpoint, Thomas (1980) defined self-concept as:

> 'the image or picture the person has of himself, which has developed through childhood and adolescence under the formative influences of home, school and social environment, and forms his behaviour.' (p. 24)

Not all theorists saw self-concept in the same light as Thomas. For example, Labenne and Greene (1969) defined self-concept as

> 'the person's total appraisal of his appearance, background and origins, abilities and resources, attitudes and feelings which culminate as a directive force in behaviour.' (p. 10)

Thomas highlighted the descriptive element of self-concept – the image or picture aspect, whereas Labenne and Greene emphasised its evaluative element – the appraisal aspect. Although neither of the definitions is wrong, both may be incomplete.

Burns (1982) incorporated both the descriptive and evaluative aspects into his definition of self-concept. He asserted that

> 'Self-concept is composed of all the **beliefs** and **evaluations** you have about yourself. These beliefs (self-images) and evaluations (self-esteem) actually determine not only who you are, but what you think you are, what you think you can do and what you think you can become.' (p. 1)

To Burns and theorists like Epstein (1973), Gecas (1982), and Rosenberg (1979), self-esteem is assumed to be more of an affective evaluation of self, that is, how the individual feels about the different attributes of the self (Wigfield & Karpathian, 1991).

Shavelson, Hubner and Stanton (1976) formulated a similar but more comprehensive definition of self-concept based on early theories of James (1890) and Cooley (1912), and extensive review of empirical studies. They posited that

> 'Self-concept is an individual's perception of self formed through experience with the environment, interactions with significant others, and attributions of his or her own behaviour. It is both **descriptive** and **evaluative** and is **multidimensional** and **hierarchically** organised, with perceptions moving from inferences about self in subareas to broader areas and finally to general self-concept...'
>
> (cited in Marsh, Relich & Smith, 1983, p. 173)

As opposed to Burns (1982), Epstein (1973), Gecas (1982) and Rosenberg (1979), Shavelson et al. found little or no evidence in support of the distinction between self-esteem and self-concept.

Essentially, Shavelson et al.'s definition of self-concept included the descriptive and evaluative aspects of self-concept. It also highlighted the importance of experience with the environment and interactions with significant others to an individual's perception of self. Thus, the definition is possibly most relevant to this study. Of particular bearing is also the assumption that self-concept is multidimensional, with academic, social, emotional and physical components. In this view, it appears theoretically sound to examine the effect of streaming on the school-related component of self-concept, namely, academic self-concept, rather than on a non-distinctive global self-concept measure.

In addition to the aforementioned, Shavelson et al. also posited that the self-concept structure is hierarchical, with perceptions of specific behaviours at the base, moving to inferences about self in subareas, to inferences about self in academic and non-academic areas, and finally, to inferences about self in general (Wigfield & Karpathian, 1991). A schematic representation of the proposed structure, commonly known as the *Shavelson model*, is given in Figure 2.2.1 on the following page.

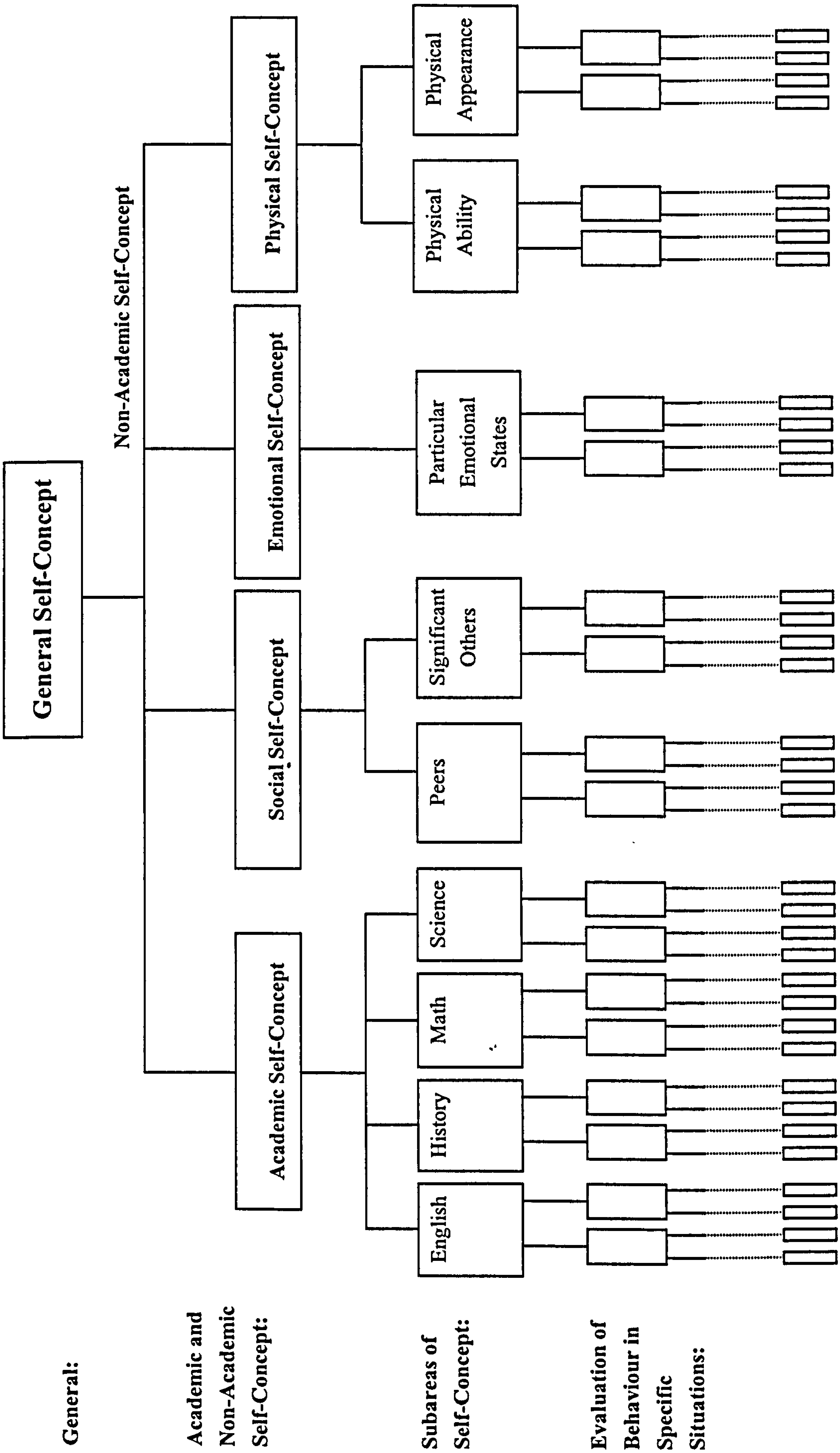


Figure 2.2.1: The Shavelson Model

In two of the earliest studies to test the hypotheses related to the Shavelson model, Shavelson and Bolus (1982) and Byrne (1986) reported strong support for both a multidimensional and hierarchical structure. Byrne and Shavelson (1986) reiterated the conclusions for the academic self-concept component of the model. Following the initial construct validity researches, several studies have tested the validity of the academic self-concept component across age (Marsh, 1987, 1990; Marsh, Byrne & Shavelson, 1988), gender (Byrne & Shavelson, 1987; Marsh, 1993) and culture (Song & Hattie, 1984). The findings are consistent in supporting the multidimensionality of the academic self-concept construct, but the hierarchical ordering remains unconfirmed.

The Shavelson model assumed that self-concepts in different academic areas correlate positively. Based on the fact that mathematics and verbal self-concepts did not correlate substantially, and that no general higher order factor could explain the common variance among mathematics and English achievements and self-concepts, Marsh and Shavelson (1985) proposed a revision of the Shavelson model. The revised model comprised of two separate second-order factors representing academic English self-concept and academic mathematics self-concept, and a variety of third-order academic facets, including a school self-concept. A simplified representation of the revised model, commonly known as the *Marsh-Shavelson model*, is given as shown in Figure 2.2.2.

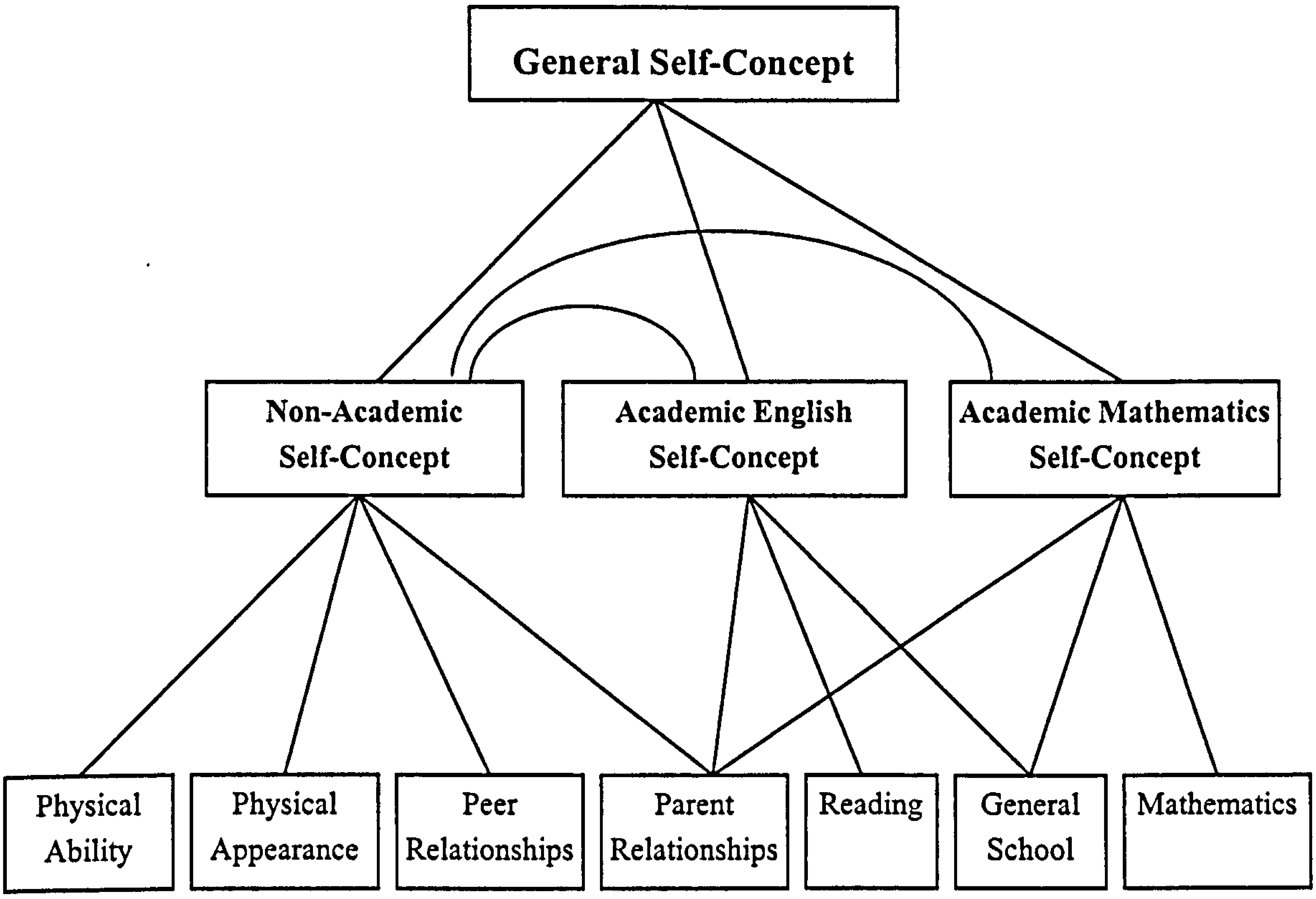


Figure 2.2.2: The Marsh-Shavelson Model

The two second-order academic factors of the Marsh-Shavelson model provided a better fit than the one second-order academic factor of the Shavelson model for studies such as Marsh (1987) and Marsh et al. (1988). Despite the success of the Marsh-Shavelson model, recent studies are still able to provide support for the construct validity of the academic self-concept factor in the Shavelson model. For instance, Skaalvik and Rankin (1990) established that 'mathematics and verbal self-concepts are not uncorrelated on the cognitive level' (p. 552). The result prompted them to conclude that 'if cognitive mathematics and verbal self-concepts do correlate substantially, a higher order general academic self-concept cannot yet be ruled out' (p. 552). Likewise, Byrne and Gavin (1996) validated that the hierarchical structure of Shavelson's academic self-concept component held for Grades 3, 7 and 11 students, with one exception each for Grades 7 and 11 students.

In studying self-development, some researchers have relied on a general measure of self-concept. The Shavelson model and the Marsh-Shavelson model, however, suggest that the content of such a measure can be quite diverse, with factors such as physical ability, physical appearance, peer relationship, cognitive competencies, etc. Given the vast number of influences, it is possible that competing and compensatory influences will mask any subtle impact of streaming on student's general self-concept. Hence, to have a clear picture and to avoid the difficulties in interpretations, this study will focus on students' academic self-concept rather than their general self-concept. Along with the success of the Marsh-Shavelson model, Marsh et al. (1988) have questioned whether such a general academic self-concept is a useful construct since it cannot adequately reflect the diversity of specific academic facets. Nonetheless, since the focus of the study is on the effect of streaming on students' general feeling about their academic abilities, and not on subject specific abilities, it is deemed more appropriate than the academic English or academic mathematics self-concept.

The operational definition of academic self-concept as used in this study is given in Section 2.9.

2.3 Students' Self-Concept

The shift in emphasis of education to the wider perspective of 'educating the whole person' (Burns, 1982, p. v) has resulted in a plethora of studies on students' self-concept, particularly, in relation to age, gender or stream effect.

2.3.1 Age and self-concept

Adolescence is usually thought of as a developmental transition during which an individual passes from childhood to maturity (Coleman & Hendry, 1990). In addition to physiological maturation, the period is usually accompanied by an intertwined network of pressures, such as cognitive changes, shifting societal expectations, conflicting role demands, increasingly complex relations with parents, peers and opposite sex, and often choices of school courses and changes in school environments (Alsaker & Olweus, 1993; Block & Robins, 1993; Bolognini, Plancherel, Bettschart & Halfon, 1996; Coleman & Hendry, 1990; Dacey & Kenny, 1997). It is also characterised as a time of questioning of self and subsequent reformulation of perceptions and evaluations of self (Block & Robins, 1993). Considering the changes that take place, many authors have postulated that adolescent years are a time of confusion and ambiguity (Burns, 1979), a period of 'storm and stress' (Hall, 1904), and a phase of 'identity crisis' (Erikson, 1959). Even among those who are unwilling to accept a 'turmoil' formulation, there is a consensus that adolescence is a difficult stage of adjustment (Rutter, Graham, Chadwick & Yule, 1976).

To test the 'crisis' hypothesis, many studies have utilised changes in self-concept as an indicator of disturbance in development. In an attempt to make sense of the findings, this review will look at studies that have examined changes in general self-concept over time before focusing on school-related self-concept.

(a) General self-concept

Zimmerman, Copeland, Shope and Dielman's (1997) longitudinal study of Grade 6 students in America (approximate age 12, N = 1160) established that for the overall sample, adolescents' self-esteem decreased significantly from Grade 6 to Grade 10.

In contrast, Wylie's (1979) review of studies conducted before 1977 concluded that there was no convincing evidence of any age effect, either positive or negative, on overall self-concept in the age range 6 to 50. Alsaker and Olweus' (1993) 2-year longitudinal study of Grades 4 to 7 students in Norway (modal age 11 to 14 respectively, N = 1689) substantiated Wylie's conclusion. Essentially, the result failed to establish any significant grade effect (cohort) or age effect on students' global negative self-evaluations from the cross-sectional and longitudinal data. Likewise, Block and Robins' (1993) longitudinal study of students in America (N = 91) found no age related changes in adolescents' self-esteem when assessed at Grade 9 (mean age 14.80), Grade 12 (mean age 17.85) and five years after Grade 12 (mean age 23.23). Chubb, Fertman and Ross' (1997) 4-year longitudinal study of Grade 9 students in America (average age 15, N = 174) also failed to establish any age effect on student's self-esteem.

Unlike the studies mentioned in the preceding paragraphs, Keltikangas' (1990) 6-year follow-up study of adolescents in Finland (age 12, 15 and 18, N = 894) established a curvilinear age effect on adolescents' total self-concept. The result revealed that total self-concept decreased during adolescence (from age 12 to age 18), but increased over late adolescence (from age 15 to age 21) and early adulthood (from age 18 to age 24) to reach the same level as that in early adolescence. However, it is noteworthy that no age effect was established on the general self-esteem component of the total self-concept measure.

The key details of the aforementioned studies are given in Appendix 2, Table 1.

Taken together, the studies do not conclusively indicate whether there is any age effect on adolescents' overall self-concept or self-esteem. The inconsistencies in findings are possibly related to the use of global and non-distinct self-measures in the reviewed studies (Crain & Bracken, 1994). Presumably, adolescents could have different perceptions about aspects of their self at different stages of their development, so age effect on specific domains could have countervailed to give contradictory findings in a unidimensional self-variable (as evidenced in

Keltikangas, 1990). Considering that people are motivated to evaluate themselves favourably (Rosenberg, 1979), the findings could also have been 'contaminated' by the effects of self-protective mechanisms. Such a 'contamination', however, will be minimal if a specific domain of self is examined, especially if the domain, like school-related self-concept, cannot be discounted easily.

(b) School-related self-concept

Liu's (1994) cross-sectional study in Singapore failed to establish any significant age effect on adolescents' academic self-concept. The results revealed no significant difference between Secondary 1 and 4 students' (Grades 7 and 10, average age 13 and 16 respectively, N = 432) responses to the academic self-concept scale and its two subscales, namely, students' confidence and students' effort. Likewise, Alawiye and Alawiye's (1988) cross-sectional study in Ghana (N = 195) reported an absence of age effect on adolescents' academic success self-esteem, although Grade 4 students had significantly higher academic success self-esteem than Grades 2, 6 and 8 students. However, it has to be cautioned that the absence of age effect in Liu's and Alawiye and Alawiye's studies is far from conclusive since both included only limited grade levels of adolescents.

In contrast to that of the aforementioned studies, Marsh et al.'s (1985) Australian study of Grades 7 to 12 adolescents (average age 12 to 17, N = 901) gave a different picture. Using a multidimensional approach, the study documented a significant quadratic age effect (curve) on general school self-concept and total academic self-concept, with the self-concepts being highest in Grades 7, 11 and 12, and nearly the lowest in Grade 9. The age effect, with no age by gender interaction, explained 1.1% and 2.0% of the variances in general school and total academic self-concepts respectively. Marsh (1989) reiterated the finding in another Australian study using the same approach. The result established a significant and primarily linear decline in general school self-concept with age for preadolescents (Grades 2 to 9, average age 7 to 14, N = 3679). The linear age effect explained 6.70% of the variance, and was demonstrated by both genders. The study also documented a relatively consistent U-shaped quadratic age effect on general school self-concept for early-to-middle adolescents (Grades 7 to 11, average age 12 to 16, N = 3073). The self-concept was slightly higher in Grade 7, declined in Grades 8 and 9, and then increased in Grades 10 and 11. The quadratic age effect explained 0.42% of the variance, and was demonstrated by both genders. Finally, the study reported a relatively consistent linear increase in general school self-concept with age for late-adolescents and young adults (age 15 and older students, N = 1202). The age effect explained 2.98% of the variance. Taken together, the results substantiate a curvilinear age effect on general school self-concept from preadolescence to early adulthood.

Similar to that of Marsh and colleagues, Lau's (1990) Hong Kong studies also utilised a multidimensional approach. His first study involved Grades 4 and 6 primary school students (age 10 and 12 respectively, N = 2096), and Grades 7, 9, 11 and 13 secondary school students (age 13, 15, 17 and 19 respectively, N = 3880). The result established significant declines in students' academic self-concept from Grade 4 to Grade 6, and Grade 7 to Grade 9, and steady increases from Grade 9 to Grade 11, and Grade 11 to Grade 13. His second study involved Grades 7 to 9 secondary students (age 13 to 15, N = 701). The result documented a significant decline in students' academic self-concept from Grades 7 and 8 to Grade 9. Clearly, the findings of Lau's studies were consistent with that of Marsh and colleagues for the same age group of students.

The key details of the above described studies are given in Appendix 2, Table 2.

The convergence of findings from Marsh and colleagues, and Lau utilising a multidimensional approach suggests that there may be a curvilinear age effect on students' academic self-concept from preadolescence to early adulthood. In particular, there appears to be an agreement that an adolescent's academic self-concept may be at its lowest around Grade 9 (approximate age 14 or 15, about Secondary 3 in Singapore). However, less consistent findings were obtained in studies where limited age range has been considered (Alawiye & Alawiye, 1988; Liu, 1994).

2.3.2 Gender and self-concept

According to Sadker and Sadker (1991), many educational practices and teacher behaviours negatively affect female students' self-esteem and academic achievement. Although recent findings suggest otherwise, the issue has been a cause of concern and has resulted in many studies. In an effort to have a clear understanding of the findings, this review will look at studies that have examined gender effect on general self-concept before focusing on school-related self-concept.

(a) General self-concept

Wylie's (1979) review concluded that there was no evidence of any significant gender effect on student's overall self-concept at any age level. Cheung and Lau's (1985) Hong Kong study of Grade 10 students (approximate age 16, N = 713), and Demo, Small and Savin-Williams' (1987) American study of preadolescents (age 10 to 17, N = 139) substantiated Wylie's conclusion. Essentially, they failed to establish any gender effect on students' self-esteem. Likewise, Isberg, Hauser, Jacobson, Powers, Noam, Weiss-Perry and Follansbee's (1989) American study of adolescents (average age 14.0 to 14.6, N = 95) did not detect any significant gender effect on students' global self-esteem. Maqsud and Rouhani's (1991) South African study of adolescents (age 16 to 17, N = 135), and Lawler and Lennings' (1992) Australian study of Grades 8 and 9 students (age 14 to 15, N = 219) also failed to establish any significant gender effect on students' self-concept.

In comparison, Keltikangas' (1990) 6-year follow-up study of adolescents in Finland (age 12, 15 and 18, N = 894) did not establish any gender effect on total self-concept at any age level. However, young adult males (age 21- and age 24-) had significantly higher scores for the general self-esteem component of the total self-concept scale than young adult females. It will be recalled that the study documented a curvilinear age effect on total self-concept, but null age effect on general self-esteem (see Section 2.3.1a). Thus, the finding suggests that the curvilinear age effect on total self-concept was comparable for both genders. In the case of the general self-esteem component, it is not known whether the developmental divergence between genders was significant because no age by gender interaction was examined.

Unlike Keltikangas' (1990) study, Chubb et al.'s (1997) longitudinal study of Grade 9 students in America (average age 15, N = 174) reported that male students had higher self-esteem than female students throughout high school, and the gender effect over the four years was significant. The result did not establish any significant grade effect or grade by gender interaction effect, hence suggesting an absence of developmental age effect for both genders. Similarly, Block and Robins' (1993) longitudinal study of students in America (N = 91) documented that male students had higher self-esteem than female students at every age assessed. The result revealed that the slight gender difference at Grade 9 (mean age 14.80), which increased at Grade 12 (mean age 17.85), became significant five years after Grade 12 (mean age 23.23). Although there was no age-related change in the overall sample's self-esteem, there was an age by gender interaction effect. Specifically, from age 14 to age 23, whilst male students' self-esteem increased by about one-fifth of a standard deviation, female students' self-esteem decreased by about one-fifth of a standard deviation. The developmental divergence in self-esteem between genders was significant. Rosenberg and Simmons' (1975) result mirrored that of Chubb and colleagues, and Block and Robbins. The cross-sectional study of Grades 3 to 12 students in America (age 8 to 15+, N = 1917) revealed that for the overall sample, female students were more likely to have low self-esteem (5% difference) than male students. In addition, more female students had low self-esteem than male students in early adolescence (4% difference), and the gender difference increased in late adolescence (7% difference).

The key details of the aforementioned studies are given in Appendix 2, Table 3.

To summarise, most of reviewed studies did not find any significant gender effect on students' global self-concept or self-esteem. However, four of them established that male students had higher self-esteem than female students. Since global self measure is non-distinctive (Lau, 1990), and can be influenced by a number of factors, the disparities in findings are comprehensible. Presumably, counterbalancing sex differences in specific areas could have interacted to give a null effect or a positive effect for male students. Hence, global measures of self should not be expected to detect crucial gender variations, and the results are likely to be limited in their interpretability (Harter, 1990).

(b) School-related self-concept

Skaalvik's (1990) Norwegian study of Grade 6 students (N = 231), and Bosacki, Innerd and Towson's (1997) Canadian study of Grade 6 students (N = 63) did not establish any gender effect on students' general academic self-esteem and school self-esteem respectively. Likewise, Quek's (1988) Singaporean study of Secondary 3 students (Grade 9, average age 15, N = 473) reported an absence of gender effect on students' responses to the academic self-concept scale, and its two subscales, namely, students' confidence and students' effort.

Similarly, Liu's (1994) Singaporean study of Secondary 1 and 4 students (Grades 7 and 10, average age 13 and 16 respectively, N = 432) revealed an absence of gender effect on students' responses to the academic self-concept scale. Nonetheless, it documented that male students had significantly higher score for the students' confidence subscale, while female students had significantly higher score for the students' effort subscale. There was no age effect (see Section 2.3.1b), or age by gender interaction effect on the scores of the academic self-concept measures, so the results suggest no decline in male and female students' academic self-concept during early to middle adolescence.

The disparities between Quek's and Liu's findings in Singapore may be explained in part by the types of schools employed in the studies. Quek's sample was made up of two girls' schools, two boys' schools and five coeducational schools, whereas Liu's sample was made up of solely coeducational schools. Since gender differences are more pronounced in coeducational setting (Marsh et al., 1983), the inclusion of the non-coeducational schools in Quek's sample could have diluted the gender effects on the scores of the subscales and rendered them non-significant.

Alawiye and Alawiye's (1988) cross-sectional study of students in Ghana (N = 195) also failed to find any significant gender effect, or grade by gender interaction effect on students' academic success self-esteem. However, Grade 4 students had significantly higher academic success self-esteem than Grades 2, 6 and 8 students (see Section 2.3.1b). Taken together, the results suggest an increase in male and female students' academic success self-esteem during preadolescence, followed by a decline from early to middle adolescence.

Nonetheless, as highlighted earlier, the interpretation of any age effect or age by gender interaction effect is questionable in Liu's, and Alawiye and Alawiye's studies since both studies included only limited age groups of adolescents.

Marsh et al.'s (1985) and Marsh's (1989) Australian studies documented similar absence of gender effect on general school self-concept of early-to-middle adolescents (Grades 7 to 11/12, average age 12 to 17). However, they reported significant gender effects, in favour of female students, for preadolescents (Grades 2 to 9 students, average age 7 to 14, second study), and late adolescents and young adults (age 15 and older students, second study). In both studies, there were significant quadratic age effects (curve), with no significant age by sex interaction effect, on general school self-concept (see Section 2.3.1b). Taken together, the results established that the curvilinear age effect on general school self-concept, with the self-concept being highest in Grades 7, 11 and 12, and nearly the lowest in Grade 9, was comparable for both genders.

Lau's (1990) results of adolescents in Hong Kong did not mirror that of Marsh and colleagues. Specifically, his first study established null gender effect on preadolescents' (Grades 4 and 6, age 10 and 12 respectively) academic self-concept. However, it documented a significant gender effect, in favour of boys, on adolescents' (Grades 7, 9, 11 and 13, age 13, 15, 17 and 19 respectively) academic self-concept. There was a significant grade by sex interaction effect on adolescents' academic self-concept. Detailed analyses showed that from Grade 7 to Grade 9, both genders witnessed a decrease in academic self-concept, with the decrease being greater for girls. From Grade 9 onwards, academic self-concepts of both genders increased, but the increase was greater for boys. His second study again reported a significant gender effect, in favour of boys, on adolescents' (Grades 7 to 9, age 13 to 15) academic self-concept. From a developmental perspective, the decline of boys' academic self-concept was less pronounced than that of girls. Nonetheless, no statistical test was employed to ascertain whether the difference in the developmental patterns between genders was significant. Lau and Leung's (1992) likewise reported a significant gender effect, in favour of boys, on adolescents' (Grades 7 to 9, average age 13 to 15, N = 1668) academic self-concept. In this case, the study did not investigate the possibility of an age effect, or an age by gender interaction.

The key details of the above described studies are given in Appendix 2, Tables 4a and 4b.

To summarise, Liu (1994) documented gender differences in adolescents' responses to the academic self-concept subscales, namely, students' confidence and students' effort, whilst Lau (1990), and Lau and Leung (1992) reported gender effects on adolescents' academic self-concept. Most of the other studies, however, seems to support an absence of gender effect on early-to-middle adolescents' academic self-concept. In addition, the convergence of findings suggests that the curvilinear age effect from preadolescence to early adulthood, highlighted in Section 2.3.1b, may be common for both genders. Particularly, there is a considerable agreement that there may be a decline in both male and female adolescent's academic self-concept during early to middle adolescence. Although Lau's (1990) finding showed otherwise, there is also evidence to suggest an absence of age by sex interaction effect on adolescents' academic self-concept. Despite the consensus, it has to be cautioned that there may be differences in the socialisation process of different cultures, so it is difficult to generalise the findings of gender effect from one country to another.

2.3.3 Stream and self-concept

> 'A pupil's self-esteem could be influenced by the type of organization of his school -- whether it is streamed or non-streamed.' (Lunn, 1970, p. 24)

Supporters of streaming believe that ability grouping is positive for all students. They contend that in homogenous classes, lessons can be better tailored to meet the needs of students such that high-ability students will be better challenged, and low-ability students will be less frustrated with learning at a pace too fast for them. By virtue of social comparison (Festinger, 1954), they suggest that the absence of bright students in lower-ability stream classes gives less academically inclined students a chance not to be reminded of their inadequacies. Consequently, they will have comparable if not higher self-concept than their higher-ability stream counterparts. Others, however, believe that assigning students to lower-ability stream classes has a stigmatising effect that evokes in students low expectations for achievement and behaviour (Slavin, 1988). They contend that streaming lowers the aspirations of students in all streams except the top stream, leading students to underrate their abilities and develop poor self-concept. While the debate has resulted in numerous studies, the findings have been inconsistent. The discrepancy is largely due to the fact that some studies have compared ability-grouped students with their ungrouped counterparts, whereas others have compared students in different ability stream classes (Fuligni, Eccles & Barbe, 1995). In an attempt to make sense of the findings, this literature survey will look at the two different types of studies separately.

(a) Comparisons between streamed and unstreamed groups

Kulik and Kulik's (1982) and Kulik's (1985) meta-analyses of 15 and 24 studies respectively both established a near zero stream effect on students' self-concept. Although the conclusions are consistent, the null stream effect was obtained by collapsing a wide range of results of high-, average- and low-ability students. Considering that a student's self-evaluation of abilities is contingent upon his or her social comparison group, it is tenable that the effect of streaming may vary as a function of the student's ability-grouping level.

Lunn's (1970) in-depth study of 14 pairs of streamed and unstreamed junior schools in England and Wales (age 9 to 10, N = 2311) was one of the studies that examined stream effect for students in different ability groups. The result revealed that there was little difference in the above average-ability students' academic self-image in streamed and unstreamed schools. However, boys of below average-ability tended to have poorer academic self-image in unstreamed schools. Lunn contended that the students had low academic self-image because they had no chance of experiencing success in unstreamed classes. In comparison, many of their streamed counterparts were not captive at the bottom of their more homogeneous classes. They had realistic chances of experiencing success. Consequently, they had more positive academic self-image than their unstreamed counterparts. Yehezkel and Resh's (1984) results on Grades 8 and 9 students in Israel (N = 4000) paralleled that of Lunn (1970). The study established that, despite an increase in academic achievement, being in an unstreamed class lowered low-ability students' academic self-image and learning motivation.

Nonetheless, other studies do not support that streaming has a positive effect on low-ability students' affective measures. For example, Carlberg and Kavale's (1980) meta-analysis of studies from the special education literature found that when slow learners were placed in segregated classrooms, they scored significantly lower on social or personality measures than slow learners in the mainstream. Similarly, Noland and Taylor's (1986) meta-analysis of 50 studies found that streamed students had lower affective outcome scores than unstreamed students. The effect sizes (ES) for academic self-concept and self-esteem were -0.30 and -0.36 respectively, which showed that academic self-concept or self-esteem of streamed students was approximately one third of a standard deviation lower than that of their unstreamed counterparts. Specifically, the negative impact of streaming on low-ability students' affective measures (ES = -0.35) was documented to be twice as great as that on the average-ability students (ES = -0.15), and three and a half time as great as that on the high-ability students (ES = -0.09).

In contrast, Fuligni et al.'s (1995) longitudinal study of Grade 7 students in Michigan (N = 1139) did not establish any group effect on Grade 10 low-ability students' mathematics self-concept and achievement-related self-concepts (self-concept of leadership and self-concept of intelligence). The results also revealed no significant group effect on medium-ability students' mathematics self-concept and self-concept of intelligence, but medium-grouped students had higher self-concept of leadership than medium-ungrouped students. In addition, there was no significant group effect on high-ability students' mathematics self-concept, but high-grouped students had higher self-concept of leadership and self-concept of intelligence than high-ungrouped students. Taken together, ability grouping appeared to have an impact on only medium- and high-ability students' achievement-related self-concepts, with grouped adolescents considering themselves higher in intelligence and leadership than their ungrouped peers. The researchers contended that 'being placed in a low-ability mathematics class did not have a long term effect on the low-ability students' self-concepts as would be predicted by social labelling theories' (p. 85). They concluded that self-concept of ability is affected by more salient indicators of performance and immediate, within-classroom social comparison processes rather than by the labelling associated with between-classroom experiences.

The key details of the aforementioned studies are given in Appendix 2, Table 5.

In summary, there is evidence from the reviewed studies to support a positive, negative, or null stream effect on high-, medium- and low-ability students' affective domains. The disparities may be related to the fact that the studies were conducted in different countries, with different educational policies and students from different age groups. In addition, they examined different self-concept measures, ranging from academic self-image to self-concept of intelligence.

(b) Comparison between ability streams

Abadzi (1984) examined the responses of Grade 4 students in Texas (N = 667) who were streamed at the beginning of the academic year into high- and regular-ability groups. The pre- and post-test were conducted at the beginning and towards the end of Grade 4 respectively. The result revealed that the differences between high- and regular-ability students' pre-test self-esteem scores and post-test self-esteem scores were not significantly different when the students' Grade 3 academic achievement scores were covaried. For the marginal groups, which consisted of students who scored within one standard error on each side of the streaming criterion, the difference in their pre-test self-esteem scores was not significant. In contrast, the difference in their post-test self-esteem scores was significant. Based on the finding, streaming seems to have accentuated the difference between the two formerly comparable groups. In a follow-up study, Abadzi (1985) assessed the students a month before the end of Grade 5. The result established that the difference between the high- and regular-ability students' follow-up self-esteem scores were generally explained by the students' Grade 3 academic achievement scores. However, there was greater differentiation in the marginal groups' follow-up self-esteem scores.

Although Abadzi's results suggest that streaming mainly affects the self-esteem of marginal groups, there are studies that showed otherwise. For example, Oakes' (1982, 1985) study of high school classes in America revealed significant differences between different ability classes in students' educational aspirations, academic and general self-concepts. The results established that students in high-ability classes had higher educational aspirations, more positive self-perceptions, generally and academically, than students in low-ability classes. Similarly, Vanfossen, Jones and

Spade's (1987) and Berends' (1995) analysis of the High School and Beyond data (base year and first follow-up study) in America reported largely consistent findings. In essence, the earlier study of Grade 10 students (N = 14 825) established negative stream effects on students' self-esteem and educational expectations. The result revealed that students in different tracks had significantly different self-esteem and educational expectations. Essentially, the academic track students had the highest scores, followed by the general track students, and then the vocational track students. In addition, the academic track students' self-esteem scores increased slightly between Grade 10 and Grade 12, while that of the general track students remained stable, and that of the vocational track students declined. Likewise, the latter study of Grade 10 students (N = 25 875) also found evidence of negative stream effect on lower track students' educational aspirations. In this case, even after accounting for dropping out and prior school bonding, placements in lower tracks in Grade 10 was found to have negative effects on students' college expectations in Grade 12. As compared to academic track students, being in general track and vocational track contributed to -0.196 decline (about 7% of a standard deviation) and -0.474 decline (about 20% of a standard deviation) respectively in college expectations.

Galloway and Schwartz's (1994) in-depth study of Stevenson High School in Chicago provided further evidence that students in lower-ability stream classes had lower self-esteem and lower expectations of themselves. In addition, the students had fewer positive role models, were less motivated, and were less likely to achieve.

Byrne's (1988) Canadian study of Grades 11 and 12 students (N = 830) examined stream effect with a hierarchical model of self-concept (Shavelson et al., 1976, see Section 2.2). In line with the other studies, it established negative stream effects on low-ability stream students' academic, English and mathematics self-concepts. Specifically, the largest difference between ability streams was obtained for academic self-concept, followed by mathematics and English self-concepts. The difference between ability streams for general self-concept, however, was not significant. Apparently, despite having negative academic self-concept, the low-ability stream students had comparable general self-concept to that of their high-ability stream counterparts. Byrne's (1990) Canadian study of Grades 9 to 12 students (N = 1897) reiterated that high-ability stream students had higher academic self-concept and academic achievements than their low-ability stream counterparts. Again, the difference between ability streams for general self-concept was marginal.

Similarly, Liu's (1994) Singaporean study of Secondary 1 and 4 students (Grades 7 and 10, average age 13 and 16 respectively, N = 432) documented significant stream effects on students' academic self-concept. The result revealed that higher-ability stream students had significantly higher scores for the academic self-concept scale and students' effort subscale than their lower-ability stream counterparts. Likewise, the marginal higher-ability stream students had significantly higher score for the students' effort subscale than the marginal lower-ability stream students.

The key details of the above reviewed studies are given in Appendix 2, Table 6.

To summarise, there appears to be no consensus about the effect of streaming on students' global self-concept. Some studies established a negative stream effect (Galloway & Schwartz, 1994; Oakes, 1982, 1985; Vanfossen et al., 1987), while others reported a null stream effect (Byrne, 1988, 1990). Since global self-concept is susceptible to the effects of self-protective mechanisms, the disparities in findings are not surprising. As noted by Byrne (1988, 1990), lower-ability stream students may know of their inferior academic ability but choose to attribute little value to their academic attainment. In such a case, it is tenable that their low academic achievement and academic self-concept have little bearing on their overall self-concept.

In comparison to global self-concept, the picture is clearer in terms of the effect of streaming on students' academic self-concept. Apparently, most studies documented a negative stream effect on lower-ability stream students' academic self-concept (Byrne, 1988, 1990; Liu, 1994; Oakes, 1982, 1985). Nonetheless, due to differences in educational policy, streaming criteria, student and teacher variables, geographical and cultural characteristics, it is often difficult to generalise from one situation to another. Thus, there is a need for a longitudinal study to be conducted in Singapore to look into the possible short- and long-term impact of streaming on students' academic self-concept under the New Education System (see Section 1.2).

2.4 Students' Perception of Home Environment

According to Bowlby (1973), 'human beings of all ages are happiest and are able to deploy their talents to best advantage' when they experience 'trusted others as standing behind them' (p. 25). Since parents are among the most important people in the life of adolescents (Juhasz, 1989a, 1989b; Juhasz & Yue, 1989; Lempers & Clark-Lempers, 1992), adolescents' perception of parental regard and support should be central to their sense of self-worth and well-being. In this view, it is not surprising that many studies have examined students' perception of home environment or their relationship with parents. The bulk of the work has focused on age or gender effect, but not much work has been done in terms of the possibility of a stream effect.

2.4.1 Age and home environment

Adolescence is a time during which children typically gain physical and psychological independence from their families (Dacey & Kenny, 1997). Based on the fact that adolescents may spend less time with their family members, and more time interacting with the larger world, it is likely that their perception of home environment, especially relationships with parents, may decline over time.

The aforementioned contention of a negative age effect is supported by many studies. For instance, Marsh et al.'s (1985) and Marsh's (1989) Australian studies documented a significant and primarily linear decline in parents relations score with age. Specifically, the earlier study established that linear and quadratic age effects could explain 2.1% and 1.2% of adolescents' (Grades 7 to 11, average age 12 to 17, N = 901) parents relations score respectively. The later study reported that linear and quadratic age effects could explain 1.28% and 0.67% (U-shaped) of preadolescents' (Grades 2 to 9, average age 7 to 14, N = 3679) parents relations score respectively. In addition, they could explain 2.97% and 0.63% (inverted U-shaped) of early-to-middle adolescents' (Grade 7 to 11, average age 12 to 16, N = 3073) parents relations score respectively. There was, however, no significant age effect on late adolescents' and young adults' (age 15 and above, N = 1202) parents relations score. Keltikangas' (1990) Finnish study established that adolescents' (age 12, 15 and 18, N = 894) home-parent score tended to decrease after 6 years, and the decline was almost significant ($p<0.07$). Furman and Buhrmester's (1992) American study of Grades 4, 7, 10 and college students (average age 9.3, 12.4, 15.5 and 19.3 respectively, N = 549) documented that students' perceived father and mother support declined significantly from Grade 4 to Grade 7, and from Grade 7 to Grade 10. Although there was a slight increase in perceived parental support from Grade 10 to college, the increase was not significant. Nonetheless, it has to be emphasised that even when perceived parental support were at its lowest in mid-adolescence, the ratings of these relationships were only exceeded by those of friends.

Instead of focusing on a one-dimensional parental support/relational measure, Ryan, Stiller and Lynch's (1994) American study of Grades 7 and 8 students (N = 606) examined different dimensions of early adolescents' relationships with parents. The result revealed that Grade 7 students were more likely to turn to their parents for support with school concerns than Grade 8 students. However, there was no significant grade effect on adolescent's sense of emotional security with parents, emulation of parents, and utilisation of parents for emotional support.

In contrast to the aforementioned studies, Liu's (1994) Singaporean study of Secondary 1 and 4 students (Grade 7 and 10, average age 13 and 16 respectively, N = 432) failed to establish any age effect on students' perception of home environment, namely, their relationship with parents and academic support. Likewise, Smith and Muenchen's (1995) Jamaican study of adolescents (age 14 to 18, N = 174) failed to detect any significant difference between younger (age 13 to 15) and older adolescents (age 16 to 18) in their perception of family relationships self-image.

Nonetheless, it has to be noted that Ryan et al.'s (1994) and Liu's (1994) studies included only limited grade levels of students, so any interpretation of grade/age effect has to be treated with caution. Although Smith and Muenchen's (1995) study included students of age 14 to 18, the students were collapsed into two age groups while examining for age effect. Hence, subtle age differences could have been masked in the process, making any conclusion about age effect difficult.

The key details of the aforementioned studies are given in Appendix 2, Table 7.

Taken together, there appears to be a consensus that students' perception of home environment, especially adolescent-parent relationship and parental support, decreases with age from early to middle adolescence. There is also suggestion that there may be rapprochement in late adolescence. Despite the less positive perceived adolescent-parent relationship during early to middle adolescence, it has to be highlighted that parents remain highly important sources of affection throughout adolescence (Lempers & Clark-Lempers, 1992).

2.4.2 Gender and home environment

Generally, adolescence girls are more concerned with others' opinion of them, more desirous of being well-liked, more eager to avoid behaviour that elicit negative reactions, and more earnest about promoting interpersonal harmony than adolescence boys (Rosenberg & Simmons, 1975). They also tend to have greater needs for affection and close relationships with adults (Block, 1983; Ruble, 1984). Thus, it seems plausible that their perception of home environment and relationship with parents may be more positive than that of adolescence boys.

The aforementioned contention is supported by Keltikangas (1990) in a 6-year follow-up study in Finland (N = 894). The result revealed that adolescence girls had significantly higher home-parent scores than adolescence boys across the age range studied. Although the overall sample's home-parent scores declined almost significantly after 6 years (see Section 2.4.1), no age by gender interaction was examined so it is not known whether the decline was common for both genders. Likewise, Liu's (1994) Singaporean study of Secondary 1 and 4 students (N = 432) revealed that female students had significantly higher perceived relationship with parents than male students, although there was no gender difference in perceived overall home environment and academic support. In this case, there was no age effect (see Section 2.4.1) or age by gender interaction effect on any of the home environment scores. Nevertheless, as noted earlier, any interpretation of age effect in Liu's study is questionable since it included only two grade levels of students.

On the other hand, Furman and Buhrmester's (1992) American study of Grades 4, 7, 10 and college students (average age 9.3, 12.4, 15.5 and 19.3 respectively, N = 549) reported null gender effect on Grades 4 and 7 students' perceived mother support. However, it established that Grade 10 and college female students had significantly higher perceived mother support than their male counterparts. In addition, male students tended to have higher perceived father support than female students ($p<0.10$). It will be recalled that students' perceived parental support declined significantly from Grade 4 to Grade 10 (see Section 2.4.1). In this case, there was an age by gender interaction effect on perceived mother support. Specifically, the result established that female students' perceived mother support at college was greater than at Grades 7 and 10, whilst male students' perceived mother support at college was similar to that at Grade 10.

In contrast, Marsh et al. (1985) and Marsh (1989) established null gender effect on perceived parent relationship in extensive Australian studies. The results reported no gender effect or age by gender interaction effect on parents relations scores of preadolescents, early-to-middle adolescents, and late adolescents and young adults. Considering that significant age effects, which were essentially linear declines, were documented for preadolescents and adolescents (see Section 2.4.1), the results suggest that the linear declines were common for both genders from preadolescence to adolescence.

Unlike that of the aforementioned studies, Smith and Muenchen's (1995) Jamaican study of age 14 to 18 adolescents ($N = 174$) established null gender effect, age effect and age by gender interaction effect on adolescents' perceived family relationships. Although the absence of gender effect is consistent with that of Marsh and colleagues, the absence of age effect was not. However, as noted in Section 2.4.1, the null age effect of Smith and Muenchen's study is questionable since subtle age differences could have been masked when the students were collapsed into two groups, namely, age 13 to 15, and age 16 to 18. Ryan et al.'s (1994) American study of Grades 7 and 8 students ($N = 606$) likewise reported null gender effect on students' perceived relationships with parents in terms of their sense of emotional security, emulation, and utilisation of parents for emotional and school support. In this case, there was no grade by gender interaction effect, but there was a grade effect. Specifically, the result established that Grade 7 students were more likely to turn to their parents for support on school concerns than Grade 8 students (see Section 2.4.1). Nonetheless, as noted earlier, any interpretation of grade effect is inconclusive because the study only examined two grade levels.

The key details of the above reviewed studies are given in Appendix 2, Tables 8a and 8b.

There appears to be a relatively strong endorsement for an absence of gender effect on adolescents' perception of home environment, particularly adolescent-parent relationship. The finding is comprehensible since parents are important sources of affection for both genders. It is also consistent with the fact that both genders do not differ significantly when rank-ordering mothers and fathers for affection (Lempers & Clark-Lempers, 1992). However, there are studies that documented significant gender effect, in favour of girls, on students' perceived home environment (Keltikangas, 1990; Liu, 1994). The reason for the differences in findings is not clear but it is tenable that cultural differences may have affected male and female adolescents differently in their perceptions of the importance attributed to closeness to parents (Claes, 1998).

In addition to an absence of gender effect, the convergence of findings suggests that the negative age effect on perceived home environment from early to middle adolescence, highlighted in the earlier section, may be common to both genders. The conclusion for late adolescents and early adulthood, however, is less clear, with different findings from Furman and Buhrmester (1992) and Marsh (1989).

2.4.3 Stream and home environment

Parents typically ascribe great importance to academic success (Burns, 1982). As such, most parents will be proud of their children if they are streamed into the higher-ability stream, whilst some may be ashamed of their children if they are streamed into the lower-ability stream. If such disparate feelings exist and are communicated to their children, it is tenable that ability grouping may have an effect on students' relationships with parents.

There is empirical evidence to suggest that lower-ability stream students are more inclined to have disciplinary problems, as well as higher absenteeism and dropout rates than higher-ability stream students (Berends, 1995; Vanfossen et al., 1987). They also tend to lower motivation and educational aspirations than higher-ability stream students (Berends, 1995; Galloway & Schwartz, 1994; Oakes, 1985; Vanfossen et al., 1987). In this view, it is plausible that different ability stream students may experience or perceive differential parental academic support.

Despite the intuitive appeal of the aforementioned contentions, little empirical work has been done in examining the effect of streaming on students' perception of relationship with parents and parental academic support. One of the exceptions was a cross-sectional study by Liu (1994) on Secondary 1 and 4 students in Singapore (Grades 7 and 10, average age 13 and 16 respectively, N = 432). The result established that higher-ability stream students had more positive perception of home environment, namely, relationship with parents and academic support, than lower-ability stream students.

In the light of the above discussion, there is clearly a need for more studies, preferably from a developmental perspective, on the effect of streaming on adolescents' perception of home environment.

2.5 Students' Perception of School Social Climate

Students can spend up to fifteen thousand hours in school classrooms during their primary and secondary education (Rutter, Maughan, Mortimore, Ouston & Smith, 1979), so the world of school is the second most salient area in their life after home. This is the place where they learn about competition and achievement of cognitive skills, and where they learn to relate and interact with adults and children who are not their family members. This is the stage where they are judged constantly for their achievements and failures, and where they learn about themselves in terms of how they compare with others and others' opinions of them (Hamachek, 1989). Thus, the quality of life in school classrooms is of great importance to students, and their perception of school experiences is significant to their sense of well-being.

A school can be seen as a cultural system of social relationships amongst teachers, students and peers (Goodlad, 1984). Hence, students' perceived quality of school life should be contingent upon their interactions with teachers and friends. Considering that there are vast numbers of changes in the life of adolescents, it is tenable that their perceived school social climate, or relationships with teachers and peers may be moderated by their age, gender or stream membership.

2.5.1 Age and school social climate

No study has specifically examined age effect on students' perceived school social climate. Nonetheless, a general picture can be drawn from studies that have examined certain relational aspects of school social climate, such as student-teacher or student-peer relationships.

Claes' (1998) study of Grades 7, 9 and 11 adolescents (age 11 to 18, N = 377) from Canada, Belgium and Italy found that length of time spent with friends reached a peak in Grade 9 and diminished by Grade 11. In addition, although there was no age effect on frequency of shared activities with friends, or choice of friends as the closest member of the network, the level of intimacy of conversations with close friends increased with age.

In comparison, Ryan et al.'s (1994) American study of Grades 7 and 8 students (N = 606) established significant grade effects on students' perceived relationships with friends and teachers. The result revealed that Grade 8 students were more likely to turn to their friends and teachers with school problems and emotional concerns, and more likely to emulate their friends and teachers than Grade 7 students. In contrast, they had lower sense of emotional security with teachers than Grade 7 students. Liu's (1994) Singaporean study of Secondary 1 and 4 students (Grades 7 and 10, average age 13 and 16 respectively, N = 432) also reported significant age effects on student-peer and student-teacher relationships. Specifically, the result established that Secondary 4 students had better relationship with peers, but less positive relationship with teachers than Secondary 1 students. There was, however, no age effect on perceived overall classroom climate and teachers' expectations. Nonetheless, any interpretation of grade/age effect in Ryan et al.'s (1994) and Liu's (1994) studies has to be treated with caution since both studies examined only limited grade levels of students.

Furman and Buhrmester's (1992) American study of Grades 4, 7, 10 and college students (average age 9.3, 12.4, 15.5, and 19.3 respectively, N = 549) also documented age effects on students' perceived relationships with friends and teachers. In this case, however, the result revealed that perceived support from same-sex friends peaked around Grade 7. It increased, although not significantly, from Grade 4 to Grade 7, followed by significant declines from Grades 7 and 10 to college. In comparison, perceived support from teachers declined significantly from

Grade 4 to Grade 7, and from Grade 4 to Grade 10. The increase between Grade 7 and Grade 10 was not significant.

The key details of the aforementioned studies are given in Appendix 2, Table 9.

The combined findings suggest an inverted U-shaped age effect on students' perceived relationship with friends from preadolescence to early adulthood. Nonetheless, no clear trend can be deciphered during early to middle adolescence. Claes (1998), Liu (1994) and Ryan et al. (1994) reported an increase in students' perceived support and relationship with peers, but Furman and Buhrmester (1992) documented null age effect. In addition, there appears to be a negative age effect on students' perceived relationship with teachers from preadolescence to adolescence. However, the findings are again inconclusive for early to middle adolescents. The results vary from null age effect (Furman & Buhrmester, 1992), to negative age effect (Liu, 1994), and contrasting age effects (Ryan et al., 1994).

Age effect can be masked by cohort differences. Hence, it is tenable that the inconsistencies in the reviewed findings may be related to the cross-sectional designs of the studies. In this case, the problem may have been compounded because none of the reviewed studies examined consecutive age groups over a reasonable age range. They tended to select only one age group from early-, mid- and late-adolescence. As such, there is a need for a longitudinal study to shed light on subtle changes in students' perceived relationships with friends and teachers during adolescence.

2.5.2 Gender and school social climate

Liu's (1994) Singaporean study of Secondary 1 and 4 students (Grades 7 and 10, average age 13 and 16 respectively, N = 432) did not find any gender effect, or age by gender interaction effect on students' perceived overall classroom climate, relationship with teachers, teachers' expectations and peer relationship. As noted in Section 2.5.1, Secondary 4 students had better relationship with peers, but less positive relationships with teachers than Secondary 1 students. Thus, the findings suggest that the age effects were comparable for both genders. However, since the study only included two grade levels, any interpretation has to be treated with caution.

Claes' (1998) study of Grades 7, 9 and 11 adolescents from Canada, Belgium and Italy (age 11 to 18, N = 377) did not establish any gender effect on length of time spent with friends, frequency of shared activities with friends, and choice of friends as the closest member of the network. However, it documented that girls had more intimate conversations with their close friends than boys. With regard to changes over time, it established that length of time spent with friends reached a peak in Grade 9 and diminished by Grade 11 (see Section 2.5.1). In contrast, level of intimacy of conversations with close friends increased with age, while frequency of shared activities with friends, and choice of friends as the closest member of the network remained largely comparable over time. Taken together, the findings suggest that even if there was no gender effect on time and frequency spent with friends, or importance of friendships, there could be a qualitative difference between genders in their perceived level of intimacy of friendships.

In comparison, Furman and Buhrmester's (1992) American study (N = 549) documented that female students had more positive perception of relationships with friends and teachers than male students. As noted in Section 2.5.1, the study established an inverted U-shaped age effect, with a peak at Grade 7, on perceived support from same-sex friends. There was no grade by gender interaction effect, so the result suggests that the inverted U-shaped age effect was common to both genders, with female students having significantly higher scores than male students throughout the grade levels studied. In contrast, there was a grade by gender interaction effect on students' perceived support from teachers, with Grade 4 female students having significantly higher score than their male counterparts. From a developmental perspective, perceived support from teachers declined significantly from Grade 4 to Grade 7, and from Grade 4 to Grade 10, with a non-significant increase from Grade 7 to Grade 10 (see Section 2.5.1). Although the declines appeared more pronounced for female students than male students, there was no statistical test to ascertain whether the difference between genders in the developmental patterns was significant.

Ryan et al.'s (1994) American study (N = 606) likewise documented gender effect on perceived relationships with friends. The result revealed that girls were more willing to turn to their friends for emotional problems and school concerns, and more likely to emulate their friends than boys. It will be recalled that the study found that Grade 8 students were more likely to turn to their friends with school problems and emotional concerns, and more likely to emulate their friends than Grade 7 students (see Section 2.5.1). There was no grade by gender interaction effect on utilisation of friends for school concern and emulation, so the positive age effect was common for both genders. There was, however, a significant grade by gender interaction effect on utilisation of friend for emotional issue. Specifically, the result established that not only were boys less likely to utilise their friends for emotional issues but that Grade 7 boys were particularly low on the measure. Unlike that of Liu (1994) and Furman and Buhrmester (1992), Ryan et al. (1994) established significant gender effects on certain aspects of adolescents' perceived relationship with teachers. Essentially, the study found that girls felt more secure with teachers, and were more willing to emulate their teachers than boys. As noted in Section 2.5.1, the study also established that Grade 8 students were more likely to turn to their teachers with school problems and emotional concerns, and more likely to emulate their teachers than Grade 7 students. In contrast, Grade 7 students felt more secure with their teachers than Grade 8 students. There was no grade by gender interaction effect so the developmental patterns of perceived relationship with teachers were comparable for both genders. Nevertheless, the study only looked at Grades 7 and 8 students, so any interpretation of grade effect is far from being conclusive.

Wentzel's (1997) 3-year longitudinal study of Grade 6 students in America (N = 248) also documented a significant gender effect on students' perceived relationship with teachers. The result revealed that female students perceived teachers to be more caring in terms of social and academic support than their male counterparts.

The key details of the above reviewed studies are given in Appendix 2, Table 10.

Taken together, the findings suggest that female students' perceived friendships could be more positive than their male counterparts in a qualitative sense, possibly in the level of support and intimacy. Nonetheless, not much work has been done from a developmental perspective, so the changes of male and female students' perceived peer relationship over time are inconclusive. There is, however, some evidence to suggest that the developmental patterns of both genders may not differ significantly. Presumably, there may be a similar inverted U-shaped age effect on perceived peer relationship for both genders from preadolescence to early adulthood (see Section 2.5.1).

In comparison, the findings for adolescents' perceived student-teacher relationship are less inconclusive. The results ranged from null gender effect (Furman & Buhrmester, 1992; Liu, 1994), to gender effect in favour of girls (Wentzel, 1997). There is also insufficient evidence to conclude whether the overall decline from preadolescence to adolescence noted in Section 2.5.1 is common for both genders.

As mentioned earlier, the limitations of the reviewed studies made it difficult to have a clear picture of the developmental patterns of students' perceived relationships with friends and teachers. The problem is possibly worse in this case since subtle gender differences may have been countervailed by contrasting trends at different stages of adolescents' development. To conclude, the review highlights a need of a longitudinal study to examine gender effects, preferably at yearly intervals, on students' perceived relationships with friends and teachers during adolescence.

2.5.3 Stream and school social climate

Some researchers have contended that streaming structures student-peer and student-teacher interactions such that stronger bond to the school is fostered for higher-ability stream students and inhibited for lower-ability stream students (Berends, 1995). Based on the contention, presumably, higher-ability stream students may perceive more positive school social climate, and enjoy better relationships with teachers and peers than lower-ability stream students.

Hargreaves' (1967) and Ball's (1981) ethnographic studies on secondary schools in England supported the aforementioned contention. The earlier study established that high-stream students liked school and exhibited greater commitment to schooling. They also liked their teachers, whose expectations they conform, whose values they support, and whose approval they seek. The latter study reported that low-stream students were more hostile towards other students and school than high-stream students, and the extreme polarisation was not observed when mixed-ability system was implemented.

Likewise, Oakes' (1982, 1985) extensive study of high school classes in America documented negative stream effects on classroom social relationships. The results revealed that high-track students perceived their teachers as less punitive towards them and more concerned about them than did low-track students. They were more likely to agree that their teachers were honest with them, were friendly, listened to them, and let them express their feelings than low-track students. They were also more likely to disagree that their teachers made fun of some students, hurt their feelings, punished them unfairly, and got mad when they asked questions. High-track students also had more positive perception of student-peer relationships, with a higher level of peer esteem and willingness to work together in classroom activities than low-track students. They were less likely to report dissonance in their classrooms, and were less inclined to agree that their classmates were unfriendly to them.

Similarly, Vanfossen et al.'s (1987) 2-year follow-up study on high school sophomore in America (Grade 10, N = 14 825) reported negative stream effect on perceived teacher treatment. The result revealed that general and vocational track senior students' perceived teacher treatment were nearly two-fifths of a standard deviation lower than that of academic track senior students.

Liu's (1994) Singaporean study of Secondary 1 and 4 students (Grades 7 and 10, average age 13 and 16 respectively, N = 432) provided further support for negative stream effects on perceived classroom social climate. The result reported that lower-ability stream students had more negative perception of overall classroom climate, relationship with teachers, and teachers' expectations than higher-ability stream students. In addition, female lower-ability stream students had more negative perception of peer relationship than female higher-ability stream students. There was, however, no significant difference between the marginal higher- and marginal lower-ability stream students in terms of their perceived overall classroom climate, relationship with teachers, teachers' expectations and peer relationship.

The key details of the aforementioned studies are given in Appendix 2, Table 11.

2.6.1 General self-concept and home environment

The presence of significant relationships between adolescents' general self-concept or self-esteem and their perceived home environment has been widely documented. For example, Bachman's (1970) American study reported positive relationships between Grade 10 boys' (N = 2213) self-esteem and family relations. Gecas and Schwalbe's (1986) American study established significant relationships between late adolescents' (age 17 to 19, N = 128) general self-esteem and perceived parental behaviour. The result showed that late adolescents' general self-esteem correlated significantly with perceived fathers' support ($r = 0.24$), fathers' participation ($r = 0.25$), and mothers' support ($r = 0.24$), but not with fathers' control, mothers' control, or mothers' participation. However, there appeared to be gender effect on the relationships. The result established that boys' general self-esteem was significantly related to perceived parental control/autonomy, while girls' general self-esteem was significantly related to parental support and participation. Moreover, the regression result revealed that perceived fathers' control was a significant predictor of boys' general self-esteem. In comparison, none of the predictors of girls' general self-esteem was significant, although the more prominent predictors were parent's and child's reports of fathers' support, and child's report of mothers' support. Taken together, perceived parental variables (excluding parental participation variables due to high correlations with parental support variables) explained over twice the variance in boys' general self-esteem ($R^2 = 0.322$) than girls' ($R^2 = 0.147$), demonstrating that boys' self-esteem was more strongly affected by perceived parental behaviours than that of girls.

Demo et al. (1987) American study documented significant relationships between adolescents' (age 10 to 17, N = 139) self-esteem and perceived parent-adolescent relationships. The result showed that adolescents' self-esteem was significantly related to perceived adolescent support of parents ($r = 0.254$), parental control ($r =$ -

To summarise, the review suggests that there is a negative stream effect on lower-ability stream students' perception of classroom climate, particularly in terms of relationships with teachers and peers. Nonetheless, it is noteworthy that none of the reviewed study examined stream effect from a developmental perspective. It is plausible that lower-ability stream students may have predisposed negative attitudes towards their teachers and classmates immediately after the streaming exercise. If the streaming policy is successful, however, lower-ability stream students may blossom in their more homogeneous classes. In such a situation, it is tenable that after a few years, they may have comparable, if not more positive, perception of classroom social climate than higher-ability stream students.

2.6 Relationship Between Self-Concept and Home Environment

Symbolic interactionists advocate that an individual's sense of self is a social product of reflected appraisals of others (see Section 2.1). In other words, one defines and evaluates oneself based on how others, especially significant others, defines and evaluates oneself, or more importantly, how one perceives one's significant others define and evaluate oneself (Cooley, 1912; Mead, 1934). Parents are among the most important persons in an adolescent's life (Juhasz, 1989a, 1989b; Juhasz & Yue, 1989; Lempers & Clark-Lempers, 1992). Thus, it is relevant that an adolescent's self-concept is related to his or her perceived regard and support from parents, and the nature of his or her relationships with them. The existence of such relationships is supported by a large body of research. In an attempt to have a clear understanding of the findings, this review will examine the relationships between students' general self-concept and their perceived home environment, before focusing on school-related self-concept. Thereafter, the general findings will be summarised to identify relevant home environment variables for use in this study.

0.183), communication ($r = 0.361$) and participation ($r = 0.360$), but not with parental support of adolescents. The relationships appeared stronger for boys than girls. Specifically, the strongest correlates of boys' self-esteem were established at 0.444 and 0.407 for perceived communication with parents and participation in joint activities respectively. Comparatively, the strongest correlates of girls' self-esteem were documented at 0.312 and 0.277 for perceived participation and communication respectively. The regression result established that adolescents' and parents' reports of parent-adolescents relationship (excluding participation and adolescents' support of parents due to high correlations with parental support of adolescents) and gender explained 16.1% of variance in adolescents' self-esteem. In particular, the addition of perceived communication (adolescents' and parents' reports) accounted for an additional 11.8% of the variance. The regression analysis also documented that adolescents' and parents' reports of parent-adolescent relationships explained over twice the variance in boys' self-esteem ($R^2 = 0.248$) than girls' ($R^2 = 0.105$).

Cheung and Lau's (1985) Hong Kong study of Grade 10 students ($N = 713$) reported significant relationships between adolescents' self-esteem and different aspects of perceived family environment. The strongest relationships were documented for perceived cohesion ($r = 0.44$, Relationship domain) and conflict ($r = -0.35$, Relationship domain), while the weakest relationships were established for achievement orientation ($r = -0.01$, Personal Growth domain) and control ($r = -0.19$, System and Maintenance domain). The rest of the relationships were moderate, ranging from 0.21 to 0.25. The regression result established that the family environment subscales uniquely explained 29% of variance in students' self-esteem, while the family and classroom environment subscales jointly explained about 33% of the variance. Specifically, the cohesion ($\beta = 0.21$), active-recreational orientation ($\beta = 0.12$) and conflict ($\beta = -0.11$) subscales of the family environment scale, and the teacher support subscale of the classroom environment scale ($\beta = 0.12$) were the most important predictors of adolescents' self-esteem. Amongst the domains, the

Relationship ($\beta = 0.38$) and Personal Growth ($\beta = 0.16$) domains of the family environment scale were the most significant predictors of adolescents' self-esteem.

Leonardson's (1986) American study of Grades 9 to 12 students ($N = 165$) reported a significant relationship between adolescents' self-concept and perceived home life ($r = 0.413$). Perceived home life was also established as a significant predictor of adolescents' self-concept. It uniquely explained about 6.07% of the variance. Although parents' marital status was significantly related to adolescents' self-concept (r for married = 0.222 and r for divorced = -0.219), it did not make any significant unique contribution to the variance in adolescents' self-concept. Comparatively, birth order and number of siblings were not significant correlates; neither were they significant unique predictors of adolescents' self-concept.

Hoelter and Harper's (1987) American study of Grades 9 to 12 adolescents ($N = 655$) documented that family support exerted direct influence on adolescent's self-esteem and son/daughter identity salience. It had positive effects on son's self-esteem ($\beta = 0.434$), son's identity salience ($\beta = 0.243$), daughter's self-esteem ($\beta = 0.346$), and daughter's identity salience ($\beta = 0.256$). The direct influence of family conflict was less substantial. Only parental conflict yielded a negative effect on boys' self-esteem ($\beta = -0.175$), while only conflict between child and parents had a negative effect on girls' self-esteem ($\beta = -0.173$). Comparatively, the mediation effects of family size and family type (living with both natural/adoptive parents and other family forms) via family support were small in magnitude. The mediation effects linking family type to boys' self-esteem and identity salience were –0.074 and –0.041 respectively. The mediation effects linking family size to girls' self-esteem and identity salience were –0.043 and –0.031 respectively. In contrast to the findings of Gecas and Schwalbe (1986), and Demo et al. (1987), Hoelter and Harper did not find any gender effect on the relationships between adolescents' self-esteem and perceived family support.

Ryan et al.'s (1994) American study of Grades 7 and 8 adolescents (N = 606) reported significant relationships between adolescents' general self-esteem and different aspects of perceived relationships with parents, namely, felt security ($r = 0.32$), emotional utilisation ($r = 0.29$), school utilisation ($r = 0.25$) and emulation ($r = 0.21$). After controlling for gender and grade, the regression also affirmed that aspects of perceived relationship with parents, namely, felt security ($\beta = 0.25$), emotional utilisation ($\beta = 0.29$), school utilisation ($\beta = 0.25$) and emulation ($\beta = 0.25$), were significant predictors of adolescents' self-esteem.

Lawler and Lenning's (1992) Australian study of Grades 8 and 9 students (N = 219) did not examine any relational dimension of home environment. Instead, it examined the impact of family type (intact, blended and sole parent) on adolescents' self-concept. The result revealed that higher self-concept was associated with intact family type, but no difference was detected in the self-concept of those in blended and sole parent family types. In addition, family type, together with conflict and socio-economic status explained slightly less than 20% of variance in adolescents' self-concept. Specifically, conflict explained 14.23% of the variance, and family type explained an additional 2.65% of the variance. Although socio-economic status was found to be significantly related to self-concept ($r = 0.24$), it did not contribute significantly to any variance in self-concept after family type and conflict.

The key details of the above reviewed studies are given in Appendix 2, Tables 12a to 12c.

2.6.2 School-related self-concept and home environment

The presence of significant relationships between adolescents' school-related self-concept and different aspects of perceived home environment has also been extensively supported. For instance, Song and Hattie's (1984) Korean study of adolescents (age 14 to 15, N = 2297) reported a direct relationship between adolescents' academic self-concept and their perceived family psychological characteristics. The result revealed that family psychological characteristics had direct impact on the academic self-concept of both genders, with the effect being stronger on male adolescents ($\beta = 0.55$) than female adolescents ($\beta \approx 0.2$). It also established that social status indicators had small indirect effects on academic self-concept via family psychological characteristics, while family structure (birth order and number of children) had negligible indirect effects on academic self-concept via family psychological characteristics.

Lau and Leung's (1992) Hong Kong study of Grades 7 to 9 students (average age 13 to 15, N = 1668) reported a significant relationship between adolescents' academic self-concept and perceived relation with parents ($r = 0.27$). The correlations were comparable for male and female students ($r = 0.26$ and 0.29 respectively), suggesting that there was no gender effect on the relationships. Detail analyses by the ANOVA revealed that perceived relation with parents had a significant main effect on academic self-concept. There was no sex by relation with parents interaction effect, establishing that students with good relation with parents, regardless of gender, tended to have higher academic self-concept. Leung and Leung's (1992) Hong Kong study of Grades 7 to 9 students (age 11 to 16, N = 1156) also documented a significant relationship between adolescents' academic self-concept and perceived relationship with parents ($r = 0.27$).

Quek's (1988) Singaporean study of Secondary 3 lower-ability stream students (Grade 9, average age = 15, N = 473) documented a significant relationship between students' academic self-concept and perceived home support. In this case, home support assessed 'the extent of help given in school work, positive reinforcement, and encouragement given to the students by members of the family' (p. 17). It did not examine some sort of relationship dimension similar to that of Gecas and

Schwalbe (1986), Demo et al. (1987), and Hoelter and Harper (1987). Thus to avoid confusion of terms, it would be referred to as academic support in all subsequent discussion. Essentially, the correlational result established that the score of the academic support measure was significantly related to the scores of the academic self-concept scale ($r = 0.18$) and its subscales, namely, students' confidence ($r = 0.19$) and students' effort ($r = 0.12$). In addition, the regression result revealed that perceived academic support predicted an extra 0.73% and 1.02% of the variances in students' academic self-concept and students' confidence respectively, in addition to the contribution of perceived school social climate and socio-economic status.

Liu's (1994) Singaporean study of Secondary 1 and 4 students (Grades 7 and 10, average age 13 and 16 respectively, $N = 432$) reiterated largely consistent findings to that of the aforementioned studies. The correlational result established that the score of the academic self-concept scale was significantly related to the scores of the home environment scale ($r = 0.42$) and its subscales, namely, relationship with parents ($r = 0.39$) and academic support subscale ($r = 0.39$). Similar correlations were documented between the scores of the academic self-concept subscales, namely, students' confidence ($0.29 \leq r \leq 0.33$) and students' effort ($0.36 \leq r \leq 0.40$), and the scores of the home environment measures. There was no stream or gender effect on any of the relationships. However, there was a significant age effect, in favour of younger students, on the relationship between the scores of the students' effort subscale and home environment scale. The regression result revealed that the home environment scale predicted an extra 5.83% and 4.25% of the variances in students' academic self-concept and students' effort respectively, in addition to that explained by the classroom climate scale (22.25% and 24.82% respectively). It was also the major predictor of students' confidence, explaining about 10.83% of its variance. A second set of regression analyses utilised the environmental subscales, ability stream, grade level, socio-economic status and Primary School Leaving Examination result (streaming criterion) as the predictive variables. The result established that the relationship with parents subscale was the second most important predictor of academic self-concept and students' effort. It accounted for an extra 6.43% and 5.81% of the variances respectively in addition to that explained by the teachers' expectation subscale (20.21% and 20.95% respectively). In comparison, the academic support subscale was the major predictor of students' confidence, explaining about 10.28% of its variance. It is noteworthy that socio-economic status was not a significant predictor of students' academic self-concept.

Raw and Marjoribanks' (1991) Australian study of adolescents (age 16, N = 312) documented that perceived family environment was a significant predictor of adolescents' academic self-concept. It uniquely explained 9.49% of the variance, and jointly explained an extra 2% of the variance with perceived school environment.

Sanders' (1996) study of Grade 8 African American students (modal age 13, N = 826) reported similar findings for perceived parental support. In this case, the parental support measure assessed students' perceived parental encouragement of academic endeavours and achievement. It did not examine some sort of relationship dimension similar to that of Gecas and Schwalbe (1986), Demo et al. (1987), and Hoelter and Harper (1987). Hence to avoid confusion of terms, it would be referred to as academic support in all subsequent discussion (similar to Quek, 1988). Essentially, the result documented a positive relationship between students' academic self-concept and perceived academic support ($r = 0.229$). It also established that perceived academic support had a significant effect on students' academic self-concept ($\beta = 0.18$).

The key details of the above reviewed studies are given in Appendix 2, Tables 13a and 13b.

2.6.3 Summary

There appears to be clear support for the presence of relationships between adolescents' self-concept and their perceived home environment. However, the actual strength and nature of the relationships vary considerably depending on the aspects of self-concept and home environment examined. Essentially, the home environment variables that were included in the reviewed studies could be classified into two categories, namely, structural variables and interpersonal variables.

Several structural variables, for instance, family-type (parents' marital status or family-structure distinctions, such as intact, blended or sole-parent), birth order, family size and socio-economic status, were examined in relation to general and school-related self-concept variables. Some studies found no relationships between family-type and self-concept (Parish, 1981; Parish, Dostal & Parish, 1981; Raschke & Raschke, 1979), while others documented that divorce had a negative effect (Hoelter & Harper, 1987; Leonardson, 1986). Although there was little if any evidence supporting the relationship of birth-order to self-concept (Leonardson, 1986; Song & Hattie, 1984), family size was reported to have a very small negative effect on girls' self-esteem (Hoelter & Harper, 1987). In the case of socio-economic status, a low positive association was found for self-esteem (Lawler & Lenning, 1992) and academic self-concept (Song & Hattie, 1984). However, it was not established as a significant predictor of general or school-related self-concept (Lawler & Lenning, 1992; Liu, 1994).

Nonetheless, when the aforementioned structural variables were studied together with family interpersonal variables, they demonstrated rather small if any impact on self-concept. For example, Leonardson (1986), who examined parents' marital status, number of siblings, birth order and students' perceived quality of home environment, affirmed that only perceived home life made significant unique contribution to students' self-concept. Likewise, Hoelter and Harper (1987), who looked at family size, family type (living with both natural/adoptive parents and other family forms), family support and family conflict, found that the indirect influences of the structural variables via family support on self-esteem had been small in magnitude. Similarly, Song and Hattie (1984), who researched into family structure (birth order and number of children), social status and family psychological characteristics, reported that the indirect effects of social status and family structure on academic self-concept were not substantial and not supported respectively.

Amongst the family interpersonal variables, the most frequently examined dimension was the closeness of parent-adolescent bond. This relationship with parents dimension was subsumed under some of the following headings:

- parental or family support (Demo et al., 1987; Gecas & Schwalbe, 1986; Hoelter & Harper, 1987);
- communication (Demo et al., 1987);
- participation (Demo et al., 1987; Gecas & Schwalbe, 1986); and
- relationship with parents (Lau & Leung, 1992; Leung & Leung, 1992; Liu, 1994; Ryan et al., 1994).

Generally, the reviewed studies reported positive and moderate associations between the relationship dimension and self-concept, with correlations of about 0.20 to 0.40. They also concurred that the dimension was a significant predictor of adolescents' self-concept. For example, Demo et al. (1987) established that perceived communication could explain an extra 11.8% of variance in adolescents' self-esteem, whilst Liu (1994) documented that perceived relationship with parents could account for an additional 6.43% of variance in adolescents' academic self-concept.

Besides the relationship with parent dimension, another commonly cited interpersonal dimension was conflict. Hess and Camara (1979) found no support for a link between conflict and self-esteem, whereas Hoelter and Harper (1987) established small negative effects of family conflict on self-esteem (β for boys = -0.175, and β for girls = -0.173). Comparatively, Cheung and Lau (1985) found a moderate negative relationship between conflict and self-esteem ($r = -0.35$), and established that conflict was a significant predictor of self-esteem. Lawler and Lenning (1992) also reported that conflict could explain 14.23% of variance in students' self-concept.

A third family interpersonal dimension that was studied in relation to self-concept was control. Gecas and Schwalbe (1986) did not find any significant association between general self-esteem and perceived parental control. In contrast, Cheung and Lau (1985), and Demo et al. (1987) obtained slight negative relationships between self-concept and control ($r = -0.19$ and $r = -0.183$ respectively).

One of the home variables that was examined specifically in conjunction with academic self-concept was some sort of parental encouragement of academic endeavours (Liu, 1994; Quek, 1988; Sanders, 1996). The reviewed studies that included an academic support dimension corroborated that the dimension was positively associated to academic self-concept ($0.18 \leq r \leq 0.39$), and was a significant predictor of adolescents' academic self-concept. Although the correlations documented by Quek (1988) were not substantial, the findings of Liu (1994) and Sanders (1996) were meaningful enough to confirm that the dimension had an effect on students' academic self-concept.

Clearly, there is a consensus among researchers that the relationship with parents and academic support dimensions have substantial impact on adolescents' academic self-concept. The findings of family conflict and parental control are less conclusive. In the light of the review, it is relevant that this study includes the former two dimensions as the home environment variables when it examines the relationship between students' academic self-concept and their perceived home environment.

There is evidence to suggest that the strength of the relationship between self-concept and perceived home environment may be a function of students' gender. In essence, Demo et al.'s (1987), and Gecas and Schwalbe's (1986) results indicated that boys' self-esteem was affected more by perceived parent-adolescent relationship than that of girls. Similarly, Song and Hattie's (1984) results suggested that boys' academic self-concept was influenced more by perceived family psychological characteristics than that of girls. In this view, there is a need for this study to examine the relationships for different subgroups of students, and ascertain whether these relationships are comparable by gender or ability stream.

2.7 Relationship Between Self-Concept and School Climate

> 'The role of the school in the development and change of self-concept is enormous. It dispenses praise and reproof, acceptance and rejection, on a colossal scale. Indeed, school provides not only the stage on which much of the drama of a young person's formative years is played, but houses the most critical audience in the world -- peers and teachers.' (Hamachek, 1989, p. 338)

Students' experiences in school have undoubtedly a huge influence on their level of self-definition (Hamachek, 1989). Considering that teachers and peers are also some of the most significant persons in students' life (Rosenberg, 1979), it is not surprising that studies have examined the relationships between students' self-concept and different aspects of their school environment. To make sense of the findings, this review will examine the relationships between students' general self-concept and their perceived school environment, before focusing on school-related self-concept. Thereafter, the general findings will be summarised to identify classroom climate variables for use in this study.

2.7.1 General self-concept and school environment

The relationship between adolescents' general self-concept or self-esteem and their perceived school environment has not been widely examined. Nonetheless, Cheung and Lau's (1985) Hong Kong study of Grade 10 students ($N = 713$) reported significant relationships between adolescents' self-esteem and perceived classroom environment. Although the relationships were weaker than that between self-esteem and perceived family environment (see Section 2.6.1), five of them were significant. The significant relationships were established for the subscales in the Relationship domain, namely, affiliation ($r = 0.17$), teacher support ($r = 0.17$) and involvement ($r = 0.13$), and two of the subscales in the System Maintenance and Change domain, namely, order and organisation ($r = 0.17$) and rule clarity ($r = 0.10$). The rest of the correlations were not significant, ranging from –0.03 to 0.07. The regression result established that the classroom environment subscales uniquely explained 7% of variance in students' self-esteem, while the family and classroom environment subscales jointly explained 33% of the variance. Although the unique contributions of the classroom environment subscales were less than that of the family environment subscales (29%, see Section 2.6.1), they were not trivial. Specifically, the teacher support subscale of the classroom environment scale ($\beta = 0.12$), together with the cohesion ($\beta = 0.21$), conflict ($\beta = -0.11$) and active-recreational orientation ($\beta = 0.12$) subscales of the family environment scale were the most important predictors of adolescents' self-esteem. In addition, the System Maintenance and Change ($\beta = 0.10$), and Relationship ($\beta = 0.09$) domains of the classroom environment scale, as well as the Relationship ($\beta = 0.38$) and Personal Growth ($\beta =$

0.16) domains of the family environment scale were significant predictors of adolescents' self-esteem.

In addition, Ryan et al.'s (1994) American study of Grades 7 and 8 adolescents (N = 606) established significant relationships between adolescents' general self-esteem and aspects of perceived relationships with teachers and friends. The significant relationships were established for three representations of relationship with teachers, namely, felt security (r = 0.13), emotional utilisation (r = 0.13) and school utilisation (r = 0.16). They were also found for two representations of relationship with friends, namely, felt security (r = 0.30) and emotional utilisation (r = 0.12). With the exception of felt security with friends, the correlations for relationships with teachers and friends, although significant, were less substantial than that of relationship with parents (r = 0.21 to 0.32, see Section 2.6.1). Contrary to the findings of Cheung and Lau (1985), the result failed to affirm the importance of relationship with teachers as predictor of adolescents' self-esteem. However, the representations of relationship with friends, namely, felt security (β = 0.24), emotional utilisation (β = 0.13), school utilisation (β = 0.15) and emulation (β = -0.15), were established as significant predictors of adolescents' self-esteem.

The key details of the aforementioned studies are given in Appendix 2, Table 14.

2.7.2 School-related self-concept and school environment

Unlike that of general self-concept, the presence of significant relationships between adolescents' school-related self-concept and aspects of perceived school environment has been extensively supported. For instance, Mboya's (1995) South African study of Grades 8 to 12 students (N = 874) established significant relationships between students' general school self-concept and aspects of perceived teacher behaviours, namely, support, interest and encouragement (r = 0.23), expectations (r = 0.30) and participation (r = 0.22). The support, interest and encouragement aspect of teacher behaviour was also a significant predictor of students' general school self-concept (β = 0.61). Wentzel's (1997) 3-year longitudinal study of Grade 6 students in America (N = 248) reported a significant relationship between students' academic effort and perceived caring from teachers (r = 0.36). Even after controlling for student characteristics, previous academic effort, and previous academic and behavioural competence, perceived caring from teachers was able to explain an additional 7% of variance in students' academic effort.

Spencer's (1976) Bolivian study of Grade 7 students (N = 1225) established a significant relationship between student's self-concept of ability and perceived significant others' influence, namely, teachers' and best friends' academic expectations (r = 0.66). The relationship was stronger than corresponding correlations between students' self-concept of ability and socio-economic status (r = 0.16), mental ability (r = 0.20) and academic performance (r = 0.34). The multivariate analysis also established that perceived significant others' influence and academic grades were the major predictors of students' self-concept of ability. Although socio-economic status had an effect on student's self-concept of ability, the effect was less significant.

Studies that examined a wider perspective of school or classroom climate instead of relational aspects of classroom interactions also documented similar findings. Hoge, Smit and Hanson's (1990) 2-year longitudinal study of Grade 6 students in America (age 11 to 13, N = 322) revealed that school variables, namely, school climate, grades, ratings by teachers, discipline, remedial studies, awards and participation, and ratings of teachers by student, could explain an extra 4% to 6% of variance in students' academic self-esteem after controlling for variables such as past academic self-esteem, IQ, family factors and bodily appearance. Amongst the individual school variables, the significant predictors of students' academic self-esteem were academic grades and the commitment subscale (school climate) in Grade 6, and teacher evaluation of work habit and the commitment subscale (school climate) in Grade 7. Further regression revealed that the school climate measure, teacher evaluations, IQ, and family background tended to dominate the groups of predictors with the largest impact on changes in students' academic self-esteem. It is noteworthy that academic grade was a significant predictor of students' academic self-esteem in Grade 6 but not in Grade 7. According to Hoge and colleagues, the difference underlines the influences of specific teachers and experiences from year to year. Presumably, it is tenable that the predictive importance of variables could also change as a function of age.

Lau and Leung's (1992) Hong Kong study of Grades 7 to 9 students (average age 13 to 15, N = 1668) established a significant relationship between adolescents' academic self-concept and perceived relation with school ($r = 0.11$). The relationship was weaker than that between academic self-concept and perceived relation with parents ($r = 0.27$, see Section 2.6.2). Nonetheless, detailed analysis by the ANOVA revealed that perceived relation with school, similar to that of perceived relation with parents, had significant main effect on academic self-concept. Although there was a slight difference between genders in the strength of the relationships (r for girls = 0.16, $p<0.001$, and r for boys = 0.07, not significant), there was no sex by relation with school interaction effect. As such, the result affirmed that relation with school had comparable effects on both male and female adolescents' academic self-concept. Leung and Leung's (1992) Hong Kong study of Grades 7 to 9 students (age 11 to 16, N = 1156) also reported a significant relationship between adolescents' academic self-concept and perceived relationship with school ($r = 0.12$). The relationship was again weaker than that between academic self-concept and relationship with parents ($r = 0.27$, see Section 2.6.2).

Quek's (1988) Singaporean study of Secondary 3 lower-ability stream students (Grade 9, average age 15, N = 473) revealed significant relationships between students' academic self-concept and perceived school social climate. The correlational result established that the score of the academic self-concept scale was significantly related to the scores of the school social climate scale ($r = 0.35$) and its subscales, namely, academic expectations ($r = 0.37$), students' behaviour and peer relationships ($r = 0.29$), teachers' support ($r = 0.21$) and principal's support ($r = 0.19$). Similar relationships were documented between the scores of the academic self-concept subscales, namely, students' confidence ($0.17 \leq r \leq 0.33$) and students' effort ($0.16 \leq r \leq 0.37$), and the scores of the school social climate measures. The regression result revealed that the school social climate scale predicted 10.88%, 8.42% and 10.91% of variances in students' overall academic self-concept, students' confidence and students' effort respectively, in addition to the contribution of the socio-economic status and home environment (academic support) variables. It also established that two of the school social climate subscales, namely, academic expectations and students' behaviour and peer relationships, were the major predictors. They accounted for 5.34% and 2.3% of variances in students' overall academic self-concept respectively, 3.91% and 2.09% of variances in students' confidence respectively, as well as 5.82% and 1.77% of variances in students' effort respectively. The teachers' support subscale was also able to explain 0.96% of variance in students' effort. It is noteworthy that the school social climate variables were better predictors of students' academic self-concept than the home environment variable (see Section 2.6.2).

Liu's (1994) Singaporean study of Secondary 1 and 4 students (Grades 7 and 10, average age 13 and 16 respectively, N = 432) reported consistent results to that of the reviewed studies. The correlational results established that the score of the academic self-concept scale was significantly related to the scores of the classroom climate scale ($r = 0.47$) and its subscales, namely, teachers' expectations ($r = 0.45$), relationship with teachers ($r = 0.38$) and peer relationship ($r = 0.31$). Similar relationships were observed between the scores of the academic self-concept subscales, namely, students' confidence ($0.22 \leq r \leq 0.32$) and students' effort ($0.32 \leq r \leq 0.50$), and the scores of the classroom climate measures. There was no stream or gender effect on any of the relationships. Nevertheless, there were significant age effects, in favour of younger adolescents, on the relationships between the scores of two of the academic self-concept variables (academic self-concept scale and students' effort subscale) and two of the classroom climate variables (classroom climate scale and peer relationship subscale). The regression result revealed that the classroom climate scale explained 22.25% and 24.82% of variances in students' academic self-concept and students' effort respectively. It also explained an extra 3.68% of variance in students' confidence in addition to that explained by the home environment scale (10.83%, see Section 2.6.2). A second regression utilised the environmental subscales, ability stream, grade level, socio-economic status measure and Primary School Leaving Examination result (streaming criterion) as the predictive variables. The result revealed that the teachers' expectations subscale was the major predictor of students' overall academic self-concept (20.21%) and students' effort (20.95%), and the second major predictor, after academic support (10.28%), of students' confidence (4.30%). Although the relationship with teachers and peer relationship subscales had less impact, the former was a significant predictor of students' effort (1.81%), whilst the latter was a significant predictor of students' overall academic self-concept (1.12%) and students' effort (0.86%).

Raw and Marjoribanks' (1991) Australian study of adolescents (age 16, N =312) established that perceived school environment was a significant predictor of adolescents' academic self-concept. It uniquely explained 3.15% of the variance, and jointly explained an extra 2% of the variance with perceived family environment.

Sanders' (1996) study of Grade 8 African American students (modal age 13, N = 826) only partially supported the aforementioned findings. The result revealed a positive relationship between students' academic self-concept and perceived teacher support (r = 0.109). Nonetheless, the structural analysis failed to affirm that perceived teacher support had any significant effect on students' academic self-concept. In comparison, perceived parental academic support was not only found to be positively correlated to students' academic self-concept (r = 0.229), it also had a significant impact ($\beta = 0.18$) (see Section 2.6.2).

The key details of the aforementioned studies are given in Appendix 2, Tables 15a to 15c.

2.7.3 Summary

Despite the inconsistencies documented in a couple of studies (Ryan et al., 1994; Sanders, 1996), there is overwhelming support for the presence of significant relationships between students' self-concept and their perceived school (classroom) climate. However, the actual strength and nature of the relationships depend on the aspects of self-concept and school environment examined.

Lau and Leung (1992), and Leung and Leung (1992) documented rather low correlations for the relationship between students' academic self-concept and perceived relation with school (0.11 and 0.12 respectively). Comparatively, Liu (1994), Mboya (1995), Quek (1988) and Spencer (1976) reported more substantial correlations for the relationships between students' academic self-concept and school variables such as principal support, teacher support, relationship with teachers, peer relationship, significant others' influence or teachers' expectations ($0.19 \leq r \leq 0.66$). Taken together, the findings suggest that a general school environment domain, which taps students' general feelings toward school, may be less closely related to students' academic self-concept than specific domains that examine students' perceived relationships with principal, teachers and peers, or teachers' expectations.

Amongst the specific school (classroom) climate variables, the most commonly employed dimension was some sort of student-teacher relationship. This relationship with teachers dimension was examined under some of the following headings:

- teacher support (Cheung & Lau, 1985; Quek, 1988; Sanders, 1996)
- teacher support, interest and encouragement (Mboya, 1995)
- perceived caring from teacher (Wentzel, 1997)
- relationship with teachers (Liu, 1994; Ryan et al., 1994)

Besides Sanders (1996), who found relatively weak relationship for students' academic self-concept, the reviewed studies generally reported positive and moderate associations between the relationship dimension and school-related self-concept, with correlations ranging from 0.21 to 0.38. However, weaker associations were documented for general self-concept (Cheng & Lau, 1985; Ryan et al., 1994). The reviewed studies also concurred, with the exception of Sanders (1996), that the relationship dimension was a significant, although weak, predictor of students' school-related self-concept.

In addition to the relationship with teachers dimension, many studies included some form of expectation dimension. For example, Liu (1994), Mboya (1995) and Quek (1988) focused on students' perceived teachers' expectations, whilst Spencer (1976) assessed students' perceived academic expectations that their teachers and best friend held of them, that is, significant others' influence. The studies generally reported positive and substantial relationships between the expectation dimension and school-related self-concept. The correlations for teachers' expectations were found to range from 0.30 to 0.45, and that of significant others' influence was 0.66. With the exception of Mboya (1995), the reviewed studies also reiterated that the dimension was a significant predictor of students' school-related self-concept. In fact, it was found to be a better predictor than the relationship with teachers dimension (Liu, 1994; Quek, 1988).

Several studies also examined some form of pupil-pupil relationship. For example, Liu (1994) and Quek (1988) reported that perceived peer relationship was positively related to students' academic self-concept, and it contributed significantly to its variance.

Finally, Quek (1988) included a principal support dimension in her study. In this case, although perceived principal support was found to be significantly correlated to students' academic self-concept, it was not a significant predictor.

Taken together, there is a clear consensus that the relationship with teachers, teachers' expectations and peer relationship dimensions have substantial impact on students' academic self-concept. The influence of principal support dimension, however, receives little support. In the light of the review, it is appropriate that this study includes the former three classroom climate dimensions as the classroom climate variables when it looks at the relationship between students' academic self-concept and their perceived classroom climate.

There has been little research on the relationships between students' academic self-concept and their perceived classroom climate for different subgroups of students. Considering that the strength of the relationship between students' academic self-concept and their perceived home environment may be moderated by students' gender (see Section 2.6.3), there is a need for this study to look at the relationships for different subgroups of students, and ascertain whether these relationships are comparable by gender or ability stream. It will be recalled that Hoge et al. (1990) found evidence to suggest that the predictive importance of variables may change as a function of students' age. As such, it is relevant that this study also examines the relative contributions of perceived classroom climate measures on students' academic self-concept at different points in time during this study.

2.8 Research Questions

From the literature review, it is apparent that there are many empirical gaps in the areas of interest to the study. Particularly, there is no conclusive evidence on the developmental changes in students' perception of classroom climate. Moreover, although the convergence of findings suggests negative age effects on students' academic self-concept and their perception of home environment from early to middle adolescence, they have not been validated in Singapore. In addition, there is no clear answer on the effect of streaming on students' academic self-concept, and their perceptions of home environment and classroom climate in the Singapore context.

It will be recalled that most of the reviewed studies only focused on large groups of students, such as overall sample, male and female students, or higher- and lower-ability stream students. It is tenable that subtle changes in students' academic self-concept, or their perceptions of home environment and classroom climate may be masked in the use of the averaged means (Hirst & DuBois, 1991). Thus, there is also a lack of understanding of smaller, heterogeneous subgroups of students with (a) different academic abilities and aptitudes, and (b) different academic self-concept, and perceptions of home environment and classroom climate. These two sets of subgroups could be termed as ability bands and clusters of students respectively.

Consequently, to fill the aforementioned empirical gaps, this study will examine the following broad categories of research questions:

(1) Are there any significant developmental changes in students' academic self-concept and their perceptions of home environment and classroom climate over time?

(2) Are there any significant differences between genders, ability streams, marginal ability streams, ability bands of students, and clusters of students in their academic self-concept, and their perceived home environment and classroom climate at any point in time?

(3) Are there any significant differences between genders, ability streams, marginal ability streams, and clusters of students in the changes in their academic self-concept, and their perceived home environment and classroom climate over time?

(4) Are there any significant relationships between students' academic self-concept and their perceived home environment and classroom climate?

(5) Are there any significant differences between genders, ability streams, and marginal ability streams in the relationships between students' academic self-concept and their perceived home environment and classroom climate?

(6) Are perceived home environment and classroom climate significant predictors of students' academic self-concept?

Specifically, the study will seek answers to the following research questions:

(I) Comparison of students' academic self-concept

(a) Overall sample

(i) Is there any significant developmental change in students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(b) *Male and Female students*

(i) Is there any significant developmental change in male students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(ii) Is there any significant developmental change in female students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(iii) Is there any significant difference between genders in students' academic self-concept, as a whole or in specific areas, in Secondary 1, 2 and 3?

(iv) Is there any significant difference between genders in the changes in students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(c) *Express and Normal students*

(i) Is there any significant developmental change in Express students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(ii) Is there any significant developmental change in Normal students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(iii) Is there any significant difference between streams in students' academic self-concept, as a whole or in specific areas, in Secondary 1, 2 and 3?

(iv) Is there any significant difference between streams in the changes in students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(d) ***Lower Express and Higher Normal students***

(i) Is there any significant developmental change in Lower Express students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(ii) Is there any significant developmental change in Higher Normal students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(iii) Is there any significant difference between Lower Express and Higher Normal students' in their academic self-concept, as a whole or in specific areas, in Secondary 1, 2 and 3?

(iv) Is there any significant difference between Lower Express and Higher Normal students in the changes in their academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(II) Comparison of students' perception of home environment

(a) ***Overall sample***

(i) Is there any significant developmental change in students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(b) ***Male and Female students***

(i) Is there any significant developmental change in male students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(ii) Is there any significant developmental change in female students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(iii) Is there any significant difference between genders in students' perceived home environment, as a whole or in specific areas, in Secondary 1, 2 and 3?

(iv) Is there any significant difference between genders in the changes in students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(c) Express and Normal students

(i) Is there any significant developmental change in Express students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(ii) Is there any significant developmental change in Normal students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(iii) Is there any significant difference between streams in students' perceived home environment, as a whole or in specific areas, in Secondary 1, 2 and 3?

(iv) Is there any significant difference between streams in the changes in students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(d) Lower Express and Higher Normal students

(i) Is there any significant developmental change in Lower Express students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(ii) Is there any significant developmental change in Higher Normal students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(iii) Is there any significant difference between Lower Express and Higher Normal students in their perceived home environment, as a whole or in specific areas, in Secondary 1, 2 and 3?

(iv) Is there any significant difference between Lower Express and Higher Normal students in the changes in their perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(III) Comparison of students' perception of classroom climate

(a) Overall sample

(i) Is there any significant developmental change in students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(b) Male and Female students

(i) Is there any significant developmental change in male students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(ii) Is there any significant developmental change in female students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(iii) Is there any significant difference between genders in students' perceived classroom climate, as a whole or in specific areas, in Secondary 1, 2 and 3?

(iv) Is there any significant difference between genders in the changes in students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(c) Express and Normal students

(i) Is there any significant developmental change in Express students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(ii) Is there any significant developmental change in Normal students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(iii) Is there any significant difference between streams in students' perceived classroom climate, as a whole or in specific areas, in Secondary 1, 2 and 3?

(iv) Is there any significant difference between streams in the changes in students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(d) Lower Express and Higher Normal students

(i) Is there any significant developmental change in Lower Express students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(ii) Is there any significant developmental change in Higher Normal students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(iii) Is there any significant difference between Lower Express and Higher Normal students in their perceived classroom climate, as a whole or in specific areas, in Secondary 1, 2 and 3?

(iv) Is there any significant difference between Lower Express and Higher Normal students in the changes in their perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3?

(IV) Relationships between students' academic self-concept and their perceived home environment and classroom climate

(a) Overall sample

Is there any significant relationship between students' academic self-concept and their perceived home environment and classroom climate in Secondary 1, 2 and 3?

(b) *Male and Female students*

Is there any significant difference between genders in the relationships between students' academic self-concept and their perceived home environment and classroom climate in Secondary 1, 2 and 3?

(c) *Express and Normal students*

Is there any significant difference between streams in the relationships between students' academic self-concept and their perceived home environment and classroom climate in Secondary 1, 2 and 3?

(d) *Lower Express and Higher Normal students*

Is there any significant difference between Lower Express and Higher Normal students in the relationships between their academic self-concept and their perceived home environment and classroom climate in Secondary 1, 2 and 3?

(V) Predictors of students' academic self-concept

(a) *Overall sample*

(i) Are perceived home environment and classroom climate significant predictors of students' academic self-concept in Secondary 1, 2 and 3?

(b) *Male and Female students*

(i) Are perceived home environment and classroom climate significant predictors of male students' academic self-concept in Secondary 1, 2 and 3?

(ii) Are perceived home environment and classroom climate significant predictors of female students' academic self-concept in Secondary 1, 2 and 3?

(c) *Express and Normal students*

(i) Are perceived home environment and classroom climate significant predictors of Express students' academic self-concept in Secondary 1, 2 and 3?

(ii) Are perceived home environment and classroom climate significant predictors of Normal students' academic self-concept in Secondary 1, 2 and 3?

(d) *Lower Express and Higher Normal students*

(i) Are perceived home environment and classroom climate significant predictors of Lower Express students' academic self-concept in Secondary 1, 2 and 3?

(ii) Are perceived home environment and classroom climate significant predictors of Higher Normal students' academic self-concept in Secondary 1, 2 and 3?

(VI) Additional subgroups comparisons

(a) *Ability bands of students*

(i) Are there any significant differences between ability bands in their academic self-concept, and their perceived home environment and classroom climate, as wholes or in specific areas, in Secondary 1, 2 and 3?

(b) *Clusters of students*

(i) Are there any significant developmental changes in students' academic self-concept, home environment and classroom climate, as wholes or in specific areas, from Secondary 1 to Secondary 3, in the different clusters?

(ii) Are there any significant differences between clusters in terms of students' academic self-concept, and their perceived home environment and classroom climate, as wholes or in specific areas, in Secondary 1, 2 and 3?

(iii) Are there any significant differences between clusters in terms of the changes in students' academic self-concept, and their perceived home environment and classroom climate, as wholes or in specific areas, from Secondary 1 to Secondary 3?

2.9 Operational Definitions

The key constructs of this study are academic self-concept, home environment and classroom climate. Since the constructs contain a multiplicity of components and can be characterised by numerous dimensions, this study cannot exhaust the range of possible elements and aspects. In an attempt to be consistent, the operational definitions of the terms as used in this study are as follows:

(a) Academic self-concept measures

- Academic self-concept is defined as students' attitudes, feelings and perceptions about their intellectual or academic skills (West, Fish & Stevens, 1980) as indicated by their responses to the items in the two subscales, namely, students' confidence and students' effort.

    - Students' confidence assesses students' perceived competence in their academic performance and ability (Quek, 1988).

    - Students' effort evaluates students' perceived academic effort (Quek, 1988).

(b) Home environment measures

- Home environment is a measure of students' responses to the items in the two home environment subscales, namely, relationship with parents and academic support.

- Relationship with parents assesses students' perceived extent in which their parents show affection for them, spend time with them, and express approval for their behaviours (Gecas & Schwalbe, 1986).

- Academic support evaluates students' perceived extent of positive reinforcement, encouragement and help given by their parents in academic areas (Quek, 1988).

(c) ***Classroom climate measures***

- Classroom climate is a measure of students' responses to the items in the three classroom climate subscales, namely, relationship with teachers, teachers' expectations and peer relationship.

  - Relationship with teachers assesses students' perceived amount of help, concern and friendship their teachers direct to them, and the extent in which their teachers talk with them, trust them and are interested in them (Moos & Trickett, 1974; Quek, 1988).

  - Teachers' expectations evaluate students' perceived teachers' belief in their academic competencies and abilities (Burns, 1982).

  - Peer relationship measures students' perceived level of friendship they feel for their classmates, namely, the extent to which they help each other with homework, get to know each other, and enjoy working together (Moos & Trickett, 1974).

In addition to the key constructs, a socio-economic status measure and a non-verbal reasoning ability measure are included in the study. The terms are defined as follows:

- Socio-economic status is determined by the occupations of the principal wage earners in students' families. The occupations are classified into unskilled, semi-skilled, skilled, and managerial and professional categories based on an adaptation of the 'Description of Occupational Groupings' (see Appendix 8) used by the MOE, Singapore.

- Non-verbal reasoning ability is a measure of students' competence in a modified British Ability Scales – Matrices (see Appendix 5).

It will be recalled that this study is also interested in subgroup comparisons between male and female students, Express and Normal students, Lower Express and Higher Normal students, ability bands and clusters of students. The terms 'male' and 'female' are self-explanatory. The rest of the terms are defined as follows:

- Express students are students, normally excluding the top 10% and the bottom 40%, who have passed their PSLE (refer to Section 1.2).

- Normal students are students, normally excluding the top 60% and the bottom 15%, who have passed their PSLE (refer to Section 1.2).

- Lower Express students are students whose PSLE results are in the lowest third of the Express sample.

- Higher Normal students are students whose PSLE results are in the highest third of the Normal sample.

- Ability bands of students are identified with the help of the streaming criterion, that is, PSLE result. Different ability bands consist of heterogeneous groups of students in terms of their academic abilities and aptitudes. Essentially, Higher Express, Middle Express, and Lower Express students are those whose PSLE results are in the highest third, middle third, and lowest third of the Express sample respectively. Higher Normal, Middle Normal, and Lower Normal students are those whose PSLE results are in the highest third, middle third, and lowest third of the Normal sample respectively.

- Clusters of students are identified with the centroid relocation method of cluster analysis. Different clusters consist of heterogeneous groups of students in terms of their self-perceptions of academic self-concept, home environment and classroom climate.

Chapter Three

Methodology

This chapter outlines the procedures involved in conducting the study. It focuses on the following sections:

3.1 The Procedure;
3.2 The Sample;
3.3 The Measures; and
3.4 The Analyses.

3.1 The Procedure

3.1.1 The Overall Strategy

As indicated in Chapter 2, no prior study has examined the effect of streaming, short- and long-term, on students' academic self-concept, and their perceived home environment and classroom climate in the Singapore context. As such, instead of replicating the results of other studies, the aim of this study was more of an exploratory nature. Since this study was unprecedented, the sample had to be representative and substantial so that the findings could be generalised to a wider population of students. Additionally, due to its exploratory nature, a large amount of information had to be collected to cover the broad areas of interest (Moser & Kalton, 1977). In view of the constraints, it was decided that this study would be conducted with the use of a questionnaire. Amongst the existing questionnaires, Liu's (1994) self-constructed questionnaire assessed all three areas of interest to this study. More importantly, it was designed for use with Singaporean students, and it had high reliability values for its measures (see Section 3.3.3b for details). Hence, it was considered a suitable instrument.

It will be recalled that in addition to examining the effect of streaming, this study also sought to explore the changes in students' perceptions from early to middle adolescence. Since this study or **developmental study,** as defined by Cohen and Manion (1980), focused on a changing process over time and not on an isolated event, it had to evaluate repeated measures over a substantial period of time. In an attempt to eliminate problems pertaining to cohorts' differences, it was decided that this study would be a 3-year longitudinal study of a single cohort of students, with repeated measures assessed at approximately 1-year intervals.

3.1.2 Piloting and Preparation

The context and type of sample examined in this study were similar to that of Liu (1994). Thus, the earlier study was considered a legitimate pilot to assess the reliability and validity of Liu's (1994) self-constructed questionnaire (Appendix 3) for use in this study.

The schools that took part in the pilot study, that is, Liu's (1994) study, were three government, double-session, coeducational secondary schools. For each school, one class each of Secondary 1 and 4 (average age 13 and 16 respectively) Express and Normal classes were randomly selected. There were a total of three Secondary 1 Express, three Secondary 1 Normal, three Secondary 4 Express and three Secondary 4 Normal classes. After the elimination of response bias cases, in which students used the same response or the same pattern of responses for a section of the questionnaire, a final sample of 432 students was obtained. The breakdown of the sample is as shown in Table 3.1.1.

Table 3.1.1: Breakdown of sample of pilot study

	Secondary 1		Secondary 4		
	Male	Female	Male	Female	Total
Express Stream	57	50	45	66	218
Normal Stream	50	47	59	58	214
Total	204		228		432

The data of the sample was utilised to assess the reliability and validity of the self-constructed questionnaire. The result revealed high reliability and acceptable validity (refer to Section 3.3.3b for details).

3.1.3 Main Procedure

For the main study, letters were sent to the MOE and three secondary school principals to ask for permission to conduct the surveys. With their consent, a question booklet containing items from Liu's (1994) questionnaire (Appendix 4), four sets of answer sheets (Appendix 4), and a non-verbal reasoning test (Appendix 5) were sent to each school with instructions for the teachers-in-charge of the data-collection.

There were altogether four data-collection waves at approximately 1-year intervals over a 3-year period. The first data-collection wave was carried out when the students were in the second week of Secondary 1 (9/1/95 to 13/1/95). The second, third and fourth data-collection waves were conducted after the students had just finished their Secondary 1, 2 and 3 end-of-year examinations respectively (late October in 1995, 1996 and 1997). The students completed a questionnaire survey at each data-collection wave, and a non-verbal reasoning test at data-collection wave 3 (end of Secondary 2). The process was straightforward for the first three data-collection waves. However, due to internal streaming at the end of Secondary 2, the students were in different classes during the fourth data-collection wave. In an attempt not to miss out any student, the final questionnaire survey was conducted for all Secondary 3 Express and Normal classes in the schools. Thereafter, students who were not involved in the earlier surveys were eliminated from the sample.

The four questionnaire surveys, namely, surveys at $time_0$, $time_1$, $time_2$ and $time_3$, were conducted with the question booklet and answer sheets 1, 2, 3 and 4 respectively. The surveys at $time_1$ to $time_3$ were conducted before the students knew their end-of-year examination results, thus the timing precludes the influence of students' academic achievements on their academic self-concept at the time of the surveys. The non-verbal reasoning test was conducted with a modified British Ability Scales (BAS) – Matrices. It consisted of 30 matrices, 28 of which were from the BAS and 2 from the examples given in the BAS (Elliot, 1983a, see Appendix 5). Ideally, the test, as in the BAS, should have been administered individually by a trained psychologist or by someone under supervision. It should also be conducted with no time limit. However, such an approach was not possible. The only feasible option was to administer the test to groups of students with a time limit set at 20 minutes. The raw score of the test, which gave a form of independent objective measure of a student's non-verbal reasoning ability, was used to ascertain whether the Express and Normal students, or other subgroups of students had significantly different ability. In addition, it was used in regression analyses to establish its contribution to variance in students' academic self-concept, as compared to that of home environment and classroom climate predictive variables.

All four data-collections were conducted with intact classes during formal lesson. They were supervised by the teachers-in-charge. For the questionnaire surveys, students were informed that the aim was to obtain their opinions on how they feel *most of the time* about their home environment, classroom climate and themselves. They were told that there were no 'correct' answers. To encourage them to indicate their true feelings, they were given the assurance of confidentiality. Before they began, instructions were explained, with particular attention given to the use of the answer sheet, and the meaning of the four-point Likert scale in Section (II) of the answer booklet. To eliminate biases from peer influence, discussion was strictly disallowed. The students took approximately 20 minutes to complete the answer sheets. At the end of each session, the question booklets were collected, together with the answer sheets, to be recycled for the next survey. The general feedback was that the items in the answer booklet were simple and straightforward.

Likewise, for the non-verbal reasoning test, instructions were explained by the teachers-in-charge before the students proceeded with the test. In this case, considerable emphasis was given to the two examples. When the students were clear about what was expected, they were given 20 minutes to complete the test.

Considering that non-response in educational research could be a result of absenteeism or truancy, both of which are atypical behaviours and could have important effects within a research (Youngman, 1979), effort was made to reduce non-response of each data collection by approaching missing students on the next school day.

In addition to the questionnaire surveys and the non-verbal reasoning test, extensive administrative work was also carried out to collect other necessary information. Essentially, the students' PSLE results were compiled through the schools' data bank, and their Secondary 1 and 2 end-of-year examination results were collated from the long mark sheets of their classes.

Although the use of questionnaire survey was an efficient way of gathering information from a large sample, more in-depth information might be obtained if interviews were also conducted. However, such an arrangement was not possible in this study because some of the principals were reluctant to sanction them. Their primary concern was that the interviews would be disruptive and would take up too much of the students' time, especially if they had to be conducted on four occasions. They were also apprehensive that the interviews might cause unhappiness amongst teachers because students would be discussing sensitive topics pertaining to student-teacher relationships and teachers' expectations.

3.2 The Sample

3.2.1 Sample Selection

The classification of secondary schools in Singapore is given as shown in Figure 3.2.1 (with reference to The Straits Times, 16 August 1997).

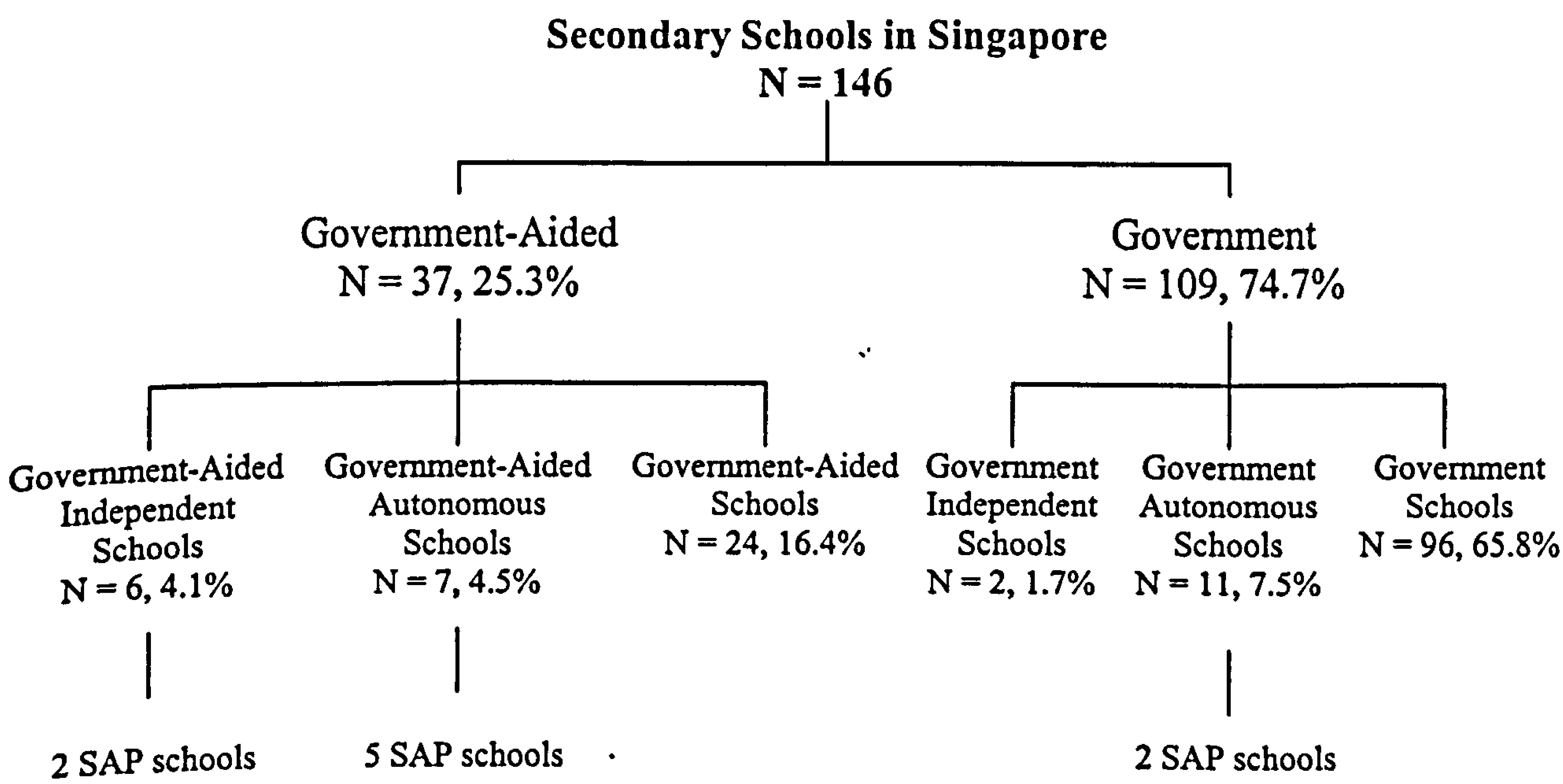


Figure 3.2.1: Classification of secondary schools in Singapore

Essentially, the government-aided schools are partly government-funded, while the government schools are fully government-funded (MOE, 1998c). Some schools are further categorised into independent and autonomous schools. An independent school is fully run by its board of governors. It enjoys autonomy in setting its own school fees, in the admission of students, in the selection and appointment of teachers and principals, and in curriculum matters. It does not come under the centralised system of the MOE, but it conforms to the national education policies, such as the bilingual policy, the teaching of Civics and Moral education, and the preparation of students for national examinations. Although an autonomous school comes under the centralised system of the MOE, it is given additional funds and more freedom to execute their mission of providing quality education. Nine of the independent and autonomous schools are also classified as Special Assistance Plan (SAP) schools. These schools are established to maintain high standards in both English and Chinese whilst preserving the traditional ethos of the schools. They offer the Special course where students learn English and Chinese as first languages.

Amongst the schools, several government autonomous and government-aided schools were set up by religious organisations, such as Buddhist associations, Catholic or Christian missionaries, or clans associated with dialect groups, such as Teochew or Hokkien clan. Hence, they have rather strong links to specific religion or clan. Considering that there may be differences in school cultures and ethos in the different types of schools, it was decided that this study would focus on only government schools. This is because there is a majority of government schools (65.8%) in Singapore, all of which are coeducational, so a study based on these schools would be most representative of the situation in the country.

After the decision was made, three government schools were chosen based on location, school ranking and accessibility. These schools were selected to cover the northern, central and western part of Singapore to ensure that the findings are not unique to certain areas. In addition, they were chosen from the league table of the top 40 schools for the Normal stream to minimise differences between schools in terms of school culture and classroom climate. The criterion used by the MOE in the ranking of schools is the average aggregate grade of English and best four subjects of Normal students' GCE 'O' level results in the school. However, if the principals did not give their consent, it would be impossible to carry out the study, so one of the selection constraints was inevitably the availability of the schools.

Assuming that about 400 cases would be needed to permit effective subgroup comparisons and regression analyses, it was decided that the initial sample would have around 600 students to allow for attrition over the years. In other words, about 200 students were needed from each school, with roughly equal proportions of Express and Normal students. Consequently, three Express and three Normal classes were randomly selected for the initial sample from two of the schools. The third school had only two Normal classes in 1995. As such, its initial sample consisted of three Express and two Normal classes.

3.2.2 The Main Characteristics

The participating schools were all government, double-session, coeducational schools. They were fairly well established, with a minimum history of 40 years. They were medium size schools, with student populations of more than 1000 and teaching staff of more than 50. They were all situated in lower-to-middle socio-economic areas in Singapore. They also shared the prestige of being one of the top 40 schools for the Normal stream. In view of the similarities between the schools, it was deemed legitimate to treat the students from the three schools as a single sample.

The initial sample consisted of 645 students, with 339 Express and 306 Normal students. After the elimination of cases who missed part of the data-collection, cases who changed school or stream between waves, and cases with clear response bias, a final sample of 495 students was obtained (see Appendix 6 for attrition information). The breakdown of the sample is given in Table 3.2.1.

Table 3.2.1: Breakdown of sample of main study

	Male			Female			
School	**A**	**B**	**C**	**A**	**B**	**C**	**Total**
Express Stream	44	51	38	50	50	51	284
Normal Stream	36	43	43	43	28	18	211
Total	255			240			495

The number of Higher Express, Middle Express, Lower Express, Higher Normal, Middle Normal and Lower Normal students, based on the definition in Section 2.9, were 91, 94, 90, 66, 76 and 65 respectively.

13 students in the final sample (2.6%) were foreigners who sought entry to the schools via the schools' entrance examinations, so they did not have PSLE results. The mean PSLE result of the remaining 97.4% of the sample was 198.51 (S.D. = 25.40). The breakdown of PSLE result by subgroup is given in Table 3.2.2.

Table 3.2.2: PSLE result by subgroup

Subgroups	N	Mean	S.D.	Range	Level of Sign.
Male	247	195.37	26.48	115 – 245	$p<0.01$
Female	235	201.80	23.83	163 – 244	
Express	275	217.16	15.49	195 – 245	$p<0.001$
Normal	207	173.72	10.27	115 – 187	
Lower Express	90	200.48	2.73	195 – 205	$p<0.001$
Higher Normal	66	182.26	2.34	179 – 187	

Interestingly, the female students had significantly higher mean score for PSLE results than male students.

The breakdown of PSLE result by ability band is tabulated in Table 3.2.3.

Table 3.2.3: PSLE result by ability band

Ability bands	N	Mean	S.D.	Range	ANOVA	
Higher Express	91	236.47	3.75	231 – 245	p<0.001	p<0.001
Middle Express	94	214.45	6.66	206 – 230		
Lower Express	90	200.48	2.73	195 – 205		
Higher Normal	66	182.26	2.34	179 – 187	p<0.001	
Middle Normal	76	175.01	2.46	171 – 178		
Lower Normal	65	163.54	12.01	115 – 170		

As shown in Table 3.2.3, the ANOVA established significant differences at 0.001 levels between the three Express ability bands, the three Normal ability bands, and the six ability bands. Specifically, the Scheffe test revealed that the differences between all the ability bands were significant at 0.05 levels.

There were 3 non-responses for the non-verbal reasoning test. The mean test score of the remaining 99.4% of the sample was 22.77 (S.D. = 3.94). The breakdown of test score by subgroup is given in Table 3.2.4.

Table 3.2.4: Non-verbal reasoning test score by subgroup

Subgroups	N	Mean	S.D.	Level of Sign.
Male	252	22.54	4.14	-
Female	240	23.01	3.71	
Express	284	24.24	3.01	p<0.001
Normal	208	20.75	4.16	
Lower Express	90	23.43	3.08	p<0.001
Higher Normal	64	21.39	3.79	

Considering that the female students had significantly higher mean score for PSLE results than the male students, it is noteworthy that both genders had comparable non-verbal reasoning test scores.

The breakdown of test score by ability band is tabulated in Table 3.2.5.

Table 3.2.5: Non-verbal reasoning test score by ability band

Ability bands	N	Mean	S.D.	ANOVA
Higher Express	91	24.74	2.60	
Middle Express	94	24.33	3.16	$p<0.05$
Lower Express	90	23.43	3.08	$p<0.001$
Higher Normal	66	21.39	3.79	
Middle Normal	76	20.72	4.69	
Lower Normal	65	20.08	3.87	

As shown in Table 3.2.5, the ANOVA established significant differences between the three Express ability bands ($p<0.05$), and the six ability bands ($p<0.001$). Specifically, the Scheffe test revealed that the Higher Express students had significantly higher test scores than the Lower Express students when comparisons were made between the three Express ability bands ($p<0.05$). In addition, the three Express ability bands had significantly higher test scores than the three Normal ability bands when comparisons were made between the six ability bands ($ps<0.05$).

All the students sat for the Secondary 1 and 2 end-of-year examinations. The mean class positions of the sample were 18.00 (S.D. = 10.35) and 16.86 (S.D. = 10.04) respectively. The breakdown of mean class position by subgroup is given in Table 3.2.6 on the following page.

It will be recalled that there was no significant gender effect on students' non-verbal reasoning ability (Table 3.2.4). As such, it is intriguing that the female students had significantly better Secondary 1 and 2 class positions (Table 3.2.6), as well as PSLE results than their male counterparts (Table 3.2.2).

Table 3.2.6: Mean class position by subgroup

Subgroups	Year	N	Mean	S.D.	Level of Sign.
Male	Sec 1	255	19.98	10.45	p<0.001
Female	Sec 1	240	15.90	9.83	
Male	Sec 2	255	19.77	9.61	p<0.001
Female	Sec 2	240	13.77	9.57	
Express	Sec 1	284	18.38	10.63	-
Normal	Sec 1	211	17.49	9.96	
Express	Sec 2	284	18.54	10.74	p<0.001
Normal	Sec 2	211	14.59	8.53	
Lower Express	Sec 1	90	21.23	9.11	p<0.005
Higher Normal	Sec 1	66	16.62	10.50	
Lower Express	Sec 2	90	20.97	10.26	p<0.001
Higher Normal	Sec 2	66	13.02	8.76	

The breakdown of mean class position by ability band is tabulated in Table 3.2.7.

Table 3.2.7: Mean class position by ability band

Subgroups	Year	N	Mean	S.D.	ANOVA
Higher Express	Sec 1	91	17.48	11.28	
Middle Express	Sec 1	94	16.88	10.80	p<0.05
Lower Express	Sec 1	90	21.23	9.11	
Higher Normal	Sec 1	66	16.62	10.50	p<0.05 (Type I error)
Middle Normal	Sec 1	76	16.34	9.31	
Lower Normal	Sec 1	65	19.49	9.85	
Higher Express	Sec 2	91	17.23	10.86	
Middle Express	Sec 2	94	17.91	10.92	p<0.05 (Type I error)
Lower Express	Sec 2	90	20.97	10.26	p<0.001
Higher Normal	Sec 2	66	13.02	8.76	
Middle Normal	Sec 2	76	13.63	8.00	p<0.01
Lower Normal	Sec 2	65	17.20	8.43	

As shown in Table 3.2.7, the ANOVA established a number of significant differences in mean class positions between the ability bands. Specifically, the

Scheffe test revealed that the Middle Express students had significantly better Secondary 1 class positions than the Lower Express students when comparisons were made between the three Express ability bands ($p<0.05$). In addition, the Higher Normal and Middle Normal students had significantly better Secondary 2 class positions than the Lower Normal students when comparisons were made between the three Normal ability bands ($ps<0.05$). The Higher Normal and Middle Normal students also had significantly better Secondary 2 class positions than the Lower Express students when comparisons were made between the six ability bands ($ps<0.05$). The Scheffe test, however, failed to establish any significant difference between the six ability bands for Secondary 1 class position, and the three Express ability bands for Secondary 2 class position. Hence, the significant differences documented by the ANOVA were dismissed as type I errors, that is, errors caused by the acceptance of differences when they are no differences (Cramer, 1994), or the rejections of null hypotheses that are true (Healey, 1993).

The results from Table 3.2.7 seem to suggest that some of the ability bands may not be significantly different in terms of their academic abilities. Nonetheless, it has to be emphasised that the six ability bands had significantly different PSLE results (Table 3.2.3). That is, they had significantly different academic achievements before they were streamed. Furthermore, the Higher Express ability band had significantly better non-verbal reasoning test scores than the Lower Express ability band, and the three Express ability bands had significantly better non-verbal reasoning test scores than the three Normal ability bands (Table 3.2.5). Taken together, the findings were able to justify the decision to treat the ability bands as six heterogeneous groups of students in terms of their academic abilities and aptitudes.

3.3 The Measures

3.3.1 The Research Constructs

The key constructs of this study were academic self-concept, home environment and classroom climate. As highlighted in Section 2.9, each of the constructs could contain many different components and could be examined from a myriad of dimensions, so a study of the various aspects was not possible. Based on the literature review, it was decided that the study would focus on the following dimensions:

(I)	Academic self-concept:	Students' confidence
		Students' effort
(II)	Home environment:	Relationship with parents
		Academic support
(III)	Classroom climate:	Relationship with teachers
		Teachers' expectations
		Peer relationship

3.3.2 The Instrument

Although there were a number of established instruments for each of the key constructs, none of them included all three constructs. Due to the length of the instruments, for example, Moos and Trickett's (1974) Classroom Environment Scale (90 items) or Battle's (1981) Culture-Free Self-esteem Inventories for Children and Adults (60 items), it was unrealistic to utilise any of them in their totality in this study. Hence Liu (1994) self-constructed questionnaire, designed from a number of established instruments, was employed instead.

(a) The design of the instrument

To answer the research questions outlined in Section 2.8, the instrument had to elicit students' background information, namely, their ability stream, gender and socio-economic status indicator, and their responses to the areas of interest. Liu's (1994) questionnaire was able to fulfil the needs with two minor changes. Firstly, a question booklet and four answer sheets were designed in place of the questionnaire so that the question booklet could be recycled in the four surveys. Secondly, the answer sheets asked students for their names instead of their class index numbers. The modification was done so that students' responses in the four questionnaire surveys could be compiled.

Essentially, Section I of the question booklet sought to obtain students' background information by directing them to write down the relevant information on the answer sheets. In answer sheet 1, students were asked for their name, class (which gives their ability stream), gender and occupation of their family's principal wage earner. The information on occupation of family's principal wage earner was elicited via open-ended questions, and was used as a measure of students' socio-economic status. Thereafter, in answer sheets 2 to 4, the students only had to write down their name, and their present and former classes.

Section II of the question booklet was the same as Section (III) of Liu's questionnaire. Part A, Towards Home, was formulated to assess students' perception of home environment. It included two home environment subscales, namely, relationship with parents and academic support. 10 items were included in each subscale to minimise error due to unforeseen ambiguity of an item, and to increase the reliability of the subscales. The subscales were constructed based on the following reference materials:

Battle (1981):	Parental Self-Esteem Subscale
Hoelter and Harper (1987):	Family Support Scale
Marsh et al. (1983):	Relations with Parents Scale
Quek (1988):	Home Support Subscale

In the light of the literature review, eight items were selected from the aforementioned instruments based on face validity to make up the relationship with parents subscale, and seven items were chosen for the academic support subscale. In addition to the fifteen items, five extra items were constructed guided by a general understanding of students in Singapore, and the suggestions of experienced professionals who have worked with adolescents.

Part B, Towards Class, was designed to assess students' perception of classroom climate. It included three classroom climate subscales, namely, relationship with teachers, teachers' expectations and peer relationship. Nine items were included in each subscale. The subscales were constructed based on the following reference materials:

Quek (1988):	Teachers' Support Subscale
	Academic Expectations Subscale
	Students' Behaviour and Peer Relationships Subscale
Moos and Trickett (1974):	Affiliation Dimension
	Teacher Support Dimension

Guided by the literature review, eight items were selected from the aforementioned instruments based on face validity for both the relationship with teachers subscale and the peer relationship subscale, and four items were chosen for the teachers' expectations subscale. In addition to the twenty items, seven extra items were constructed with the Singapore adolescents in mind, and from the advice of trained teachers and educators.

Part C, Towards Self, was devised to assess students' academic self-concept. It included two academic self-concept subscales, namely, students' confidence and students' effort. 10 items were included in each subscale. The subscales were constructed based on the following reference materials:

Battle (1981):	Academic Self-Esteem Subscale
Marsh et al. (1983):	School Subjects Self-Concept Scale
Piers and Harris (1964):	General and Academic Status Scale
Quek (1988):	Students' Confidence Subscale
	Students' Effort Subscale

In view of the literature review, 10 items were selected from the aforementioned instruments based on face validity for the students' confidence subscale, and six items were picked for the students' effort subscale. Four additional items were constructed for the students' effort subscale to elicit a more comprehensive picture of students' perception of their academic effort. The construction of the additional items was guided by a general understanding of students in Singapore, and the Involvement dimension of the Classroom Environment Scale (Moos & Trickett, 1974), which assesses the extent in which students are involved in the classroom.

After the 67 items were shortlisted, some items were re-worded so that there were positive and negative items (Appendix 7). The modification was done to avoid response set, that is, the use of a fixed answer or a fixed pattern of answers. In addition, some items were rephrased to ensure that they were not too difficult for Secondary 1 lower-ability stream students. The final questionnaire as used by Liu

(1994), and the question booklet and answer sheets as employed in the study are given in Appendices 3 and 4 respectively.

(b) The scoring system

There was no need to devise any scoring system for Section I of the instrument. However, a scoring system made up of a 4-point Likert scale, labelled 'strongly disagree', 'disagree', 'agree' and 'strongly agree', was employed for each item in Section II of the instrument. The 'neutral' option had been deliberately left out because it was felt that such a response would be difficult to interpret. In effect, the interpretation would depend on the precise nature of the response. It could include responses such as 'no opinion', 'not applicable' or 'depends', which would disrupt the ordered pattern of the 4-point scale (Youngman, 1979).

(c) The data coding

In Section I, students' stream membership was coded numerical value of 1 for Express stream, and 2 for Normal stream. Students' sex was coded 1 for male, and 2 for female. In addition, their socio-economic status were coded numerical values of 1 to 4, which corresponded to unskilled, semi-skilled, skilled, and managerial and professional occupations respectively, based on the MOE 'Description of Occupational Groupings' (Appendix 8). In Section II, the 4-point Likert scale, labelled 'strongly disagree', 'disagree', 'agree', and 'strongly agree' were already assigned numerical values of 1 to 4 respectively on the question booklet. Since students were instructed to write down the numbers representing their answers on the answer sheets, there was no need for any coding.

After the first questionnaire survey, all the answer sheets were visually inspected to determine the extent of missing information and response bias. Cases with missing information such as gender, stream or socio-economic status were kept, and the missing information filled in with the help of class registers. However, cases with missing names and response bias were eliminated. After the initial checking, case identification numbers were assigned to a sample of 645 students. Thereafter, students' responses were coded into coding boxes, and transferred onto data coding forms according to the specifications of the variable coding list. Fixed-format coding was employed so that errors could be easily detected. All missing data were coded '0' to eliminate problems during computation. Finally, the information was entered into a computer and the data file was prepared for use on the SPSS-X package.

The aforementioned procedure was repeated for subsequent questionnaire surveys. The only difference was the need to countercheck students' case identification numbers before the data could be entered into the data file. After the last questionnaire survey, students who changed schools or streams between surveys, and students who missed part of the surveys were all eliminated from the sample, resulting in a final sample of 495 students (refer to Appendix 6 for attrition information).

3.3.3 Reliability and Validity

(a) The reference instruments

Most of the items in Liu's questionnaire were selected from existing instruments. Thus, before appraising the reliability and validity of the questionnaire, it is relevant that we take a closer look at the reference measures. They were

Battle (1981):	Parental Self-Esteem Subscale
	Academic Self-Esteem Subscale
Hoelter and Harper (1987):	Family Support Scale

Marsh et al. (1983):	Relations with Parents Scale
	School Subjects Self-Concept Scale
Piers and Harris (1964):	General and Academic Status Scale
Quek (1988):	Home Support Subscale
	Teachers' Support Subscale
	Academic Expectations Subscale
	Students' Behaviour and Peer Relationships Subscale
	Students' Confidence Subscale
	Students' Effort Subscale
Moos and Trickett (1974):	Affiliation Dimension
	Teacher Support Dimension

Battle's (1981) parental self-esteem and academic self-esteem subscales are part of the Culture-Free Self-Esteem Inventories for Children and Adults (Culture-Free SEI). The structure of the SEI was established with the use of factor analysis. Specifically, the varimax rotated matrix revealed five subscales, two of which were the parental self-esteem and academic self-esteem subscales. The initial testing of the SEI revealed that the two subscales had internal consistency values (alphas) of 0.67 and 0.76 respectively for Grades 7 to 9 students, and test-retest correlations in the range of 0.67 to 0.89, and 0.70 to 0.82 respectively for the same group of students.

Hoelter and Harper's (1987) family support scale comprised of items that were selected after pretesting on diverse samples of adolescents. The testing of the scale revealed that it had internal consistency values (alphas) of 0.807 and 0.829 for Grades 7 to 9 boys and girls respectively.

Marsh et al.'s (1983) relations with parents and school subjects self-concept scales are part of the well-established Self-Description Questionnaire (SDQ), which was widely used by Byrne (1988), Lau and Leung (1992), Leung and Leung (1992), Marsh (1989), Marsh et al. (1985), and Marsh, Craven and Debus (1991). In the development of the SDQ, factor analysis was used to ensure that the items loaded most highly on the dimensions they were designed to measure and less substantially on other dimensions. The testing of the SDQ revealed that the relations with parents and the school subjects self-concept scales had internal consistency reliabilities (alphas) of 0.80 and 0.85 respectively for primary school students in the public schools.

Piers and Harris' (1964) general and academic status scale is part of an extensive instrument developed for assessing self-concept in children. In the development of the test battery, factor analysis was performed to ensure that the items loaded substantially (>0.30) on their respective factors. The initial testing revealed that the instrument had internal consistency reliabilities (Kuder-Richardson Formula 21 index) of 0.89 and 0.90 for Grade 6 girls and boys respectively, and 4-month test-retest reliabilities of 0.71 for Grade 6 students.

Quek's (1988) measures are part of a self-constructed questionnaire, which was piloted twice with Singaporean students. The questionnaire was assessed extensively for its reliability and validity. Specifically, factor analysis was utilised to justify the use of the items in their respective subscales. In addition, the Cronbach alphas, item-subscale correlations, and subscale-scale correlations were determined to establish the reliability of the instrument, while discrimination analysis was performed to assess the items' discriminatory ability. Specifically, the testing revealed that the main scales and subscales had internal consistency values (alphas) of 0.67 to 0.89. Moreover, the item-subscale and subscale-scale correlations were all significant. The discrimination analysis also affirmed that the items discriminated well between high and low scorers.

Moos and Trickett's (1974) affiliation and teacher support dimensions are two of the nine subscales of the Classroom Environment Scale (CES), which was extensively used by Cheung and Lau (1985), Lau and Leung (1992), and Leung and Leung (1992). In the development of the CES, only items that correlated most highly with the subscales they were designed to measure were selected. The initial testing revealed that the average item-subscale correlations of the affiliation and teacher support dimensions were 0.48 and 0.54 respectively. In addition, the internal consistency reliabilities (Kuder-Richardson Formula-20 indices) of the dimensions were 0.74 and 0.84 respectively, and the 6-week test-retest reliabilities were 0.73 and 0.89 respectively.

In the light of the aforementioned information, it is evident that the reference measures had high internal reliabilities, as revealed by the item-subscale correlations, subscale-scale correlations, Cronbach alphas or Kuder-Richardson indices, as well as acceptable validity amongst researchers in the areas concern, as indicated by their use of the instruments. In particular, it is noteworthy that the appropriateness of the items for many of the measures was affirmed with the use of factor analysis.

(b) The pilot study

Although the reference measures were generally reliable and valid, there was still a need to establish the reliability of Liu's questionnaire and the appropriateness of its items. Thus, the following statistical information was computed from the data collected by Liu (1994):

- Reliability: Guttman split-half reliability
  Spearman-Brown split-half reliability
  Cronbach alpha
  Item-subscale correlation
  Item-scale correlation

- Appropriateness of items: Factor loading

Reliability

A summary of the statistical information on the reliability of the questionnaire is given in Table 3.3.1 (refer to Appendix 9 for details).

Table 3.3.1: Summary of reliability findings with data from the pilot study

	'Home Environment Measures	Classroom Climate Measures	Academic Self-Concept Measures
Guttman split-half reliability coefficient	0.865	0.804	0.848
Spearman-Brown split-half reliability coefficient	0.867	0.807	0.848
Cronbach alpha	0.720 – 0.878	0.742 – 0.837	0.737 – 0.826
Average item-subscale correlation	0.597	0.548	0.562
Average item-scale correlation	0.553	0.444	0.489

Youngman (1979) has contended that scales of an introspective nature tend to have lower reliability values. However, contrary to expectations, the scales and subscales demonstrated high reliabilities, as measured by Guttman split-half reliabilities, Spearman-Brown split-half reliabilities and Cronbach alphas. In addition, the item-subscale correlations and item-scale correlations were all found to be significant ($ps<0.001$).

Appropriateness of items

The validity of the items was generally acceptable since most of the items were selected from existing instruments. Nonetheless, in an attempt to verify the appropriateness of the items with respect to their intended subscales, factor analyses were carried out on the home environment, classroom climate, and academic self-concept scales. The method of principal component analysis with varimax rotation was employed, and only factor loadings of over 0.30 were considered in the interpretation of factors (see Appendix 10).

Essentially, the factor analyses revealed that 75.0% of the items in the home environment scale (15 out of 20) had either unique or higher loading on the subscales they were designed to measure. 66.7% of the items in the classroom climate scale (18 out of 27) had either unique or higher loading on the subscales they were designed to measure. 95.0% of the items in the academic self-concept scale (19 out of 20) had either unique or higher loading on the subscales they were designed to measure. In cases where the items had lower loadings on the intended subscales than other subscales, decisions were made to leave them in the intended subscales based on the content of the items (refer to Appendix 10 for details).

In summary, it is clear that the scale and subscales of Liu's questionnaire had high reliabilities, as revealed by the split-half reliability coefficients, Cronbach alphas, item-subscale correlations and item-scale correlations. Most of the subscales also had items that loaded most highly on them than other subscales. Thus, the statistical information was able to substantiate the use of the questionnaire in the current study.

(c) The current study

The following statistical information was computed to establish the internal consistency of the instrument in the current study:

- Reliability: Guttman split-half reliability coefficient
  Spearman-Brown split-half reliability coefficient
  Cronbach alpha
  Item-subscale correlation
  Item-scale correlation

A summary of the statistical information is given in Table 3.3.2 (refer to Appendix 11 for details).

Table 3.3.2: Summary of reliability findings with data from the main study

	Home Environment Measures	Classroom Climate Measures	Academic Self-Concept Measures
Guttman split-half reliability coefficient	0.740 – 0.888	0.575 – 0.843	0.728 – 0.867
Spearman-Brown split-half reliability coefficient	0.741 – 0.892	0.591 – 0.846	0.728 – 0.868
Cronbach alpha	0.700 – 0.904	0.606 – 0.868	0.725 – 0.860
Average item-subscale correlation	0.610	0.561	0.569
Average item-scale correlation	0.568	0.468	0.502

Due to the extensive nature of this study, it was not possible to formulate a large number of items for each construct. As such, the scales were shorter than other established instruments, for example, Moos and Trickett's (1974) Classroom Environment Scale (90 items) or Battle's (1981) Culture-Free Self-esteem

Inventories for Children and Adults (60 items). Nevertheless, it is evident from Table 3.3.2 that the Guttman split-half reliability coefficients, the Spearman-Brown split-half coefficients, the Cronbach alphas, the item-subscale correlations and the item-scale correlations of the current study were able to justify the use of these shorter scales.

3.4 Statistical Analyses

To avoid confusion, it should be noted that in reference to any statistical analyses and results, the term 'factor' refers to a scale or subscale, for example, academic self-concept scale, and the term 'measure' refers to a factor at a point in time, for example, academic self-concept scale at $time_0$.

3.4.1 The Analysis Strategy

Although ordinal data were obtained for Section II of the questionnaire, it was deemed legitimate to assume sufficient closeness to interval data to employ parametric methods (Youngman, 1979). Consequently, the mean scores of the measures were used as basis for comparisons in most of the statistical analyses.

Prior to any statistical analysis, the negative items (Appendix 12) were recoded so that a high response code was indicative of a positive rating. Thereafter, the analyses, with the exceptions of Fisher's z_r transformation and cluster analysis were carried out with SPSS-X. The Fisher's z_r transformation was computed manually, and the cluster analysis was carried out with the PMMD package.

The analysis strategy for the six categories of research questions, outlined in Section 2.8, was as follows:

- Research category 1: Developmental changes in a factor over time

  The developmental changes of the students were examined over a 3-year period, that is, from about age 13 to age 15, so any significant developmental change over time could be referred to as a time effect or an age effect. Essentially, the analysis of variance (ANOVA) of single factor repeated measures was employed to determine whether any of the changes over time was statistically significant. Thereafter, the paired t-test, which evaluates pairwise differences between the mean scores of the measures, was utilised to provide a clearer picture of where any significant time effects lay.

- Research category 2: Subgroup comparisons of a factor at different points in time

  The t-test was used for comparisons of the mean scores of each measure between two subgroups, namely, male and female students, Express and Normal students, Lower Express and Higher Normal students, and the one-way ANOVA and Scheffe test were used for comparisons between more than two subgroups, namely, ability bands and clusters of students.

- Research category 3: Subgroup comparisons of changes in a factor over time

  The two-way ANOVA of single factor repeated measures was employed to determine the difference between two or more subgroups in the changes of a factor over time. If a significant subgroup by time interaction effect was established, the changes of the factor scores over time of the subgroups were computed and subjected to the t-test (two subgroups) or Scheffe test (more than two subgroups) to find out where the significant differences lay.

- Research category 4: Relationships

  The Pearson correlation coefficients were computed to establish the relationships between students' academic self-concept and their perceived home environment, and the relationships between students' academic self-concept and their perceived classroom climate.

- Research category 5: Subgroup comparisons of relationships

  The Fisher's z_r transformation was utilised to ascertain whether there was any significant difference between subgroups in the strength of the aforementioned relationships.

- Research category 6: Predictors of students' academic self-concept

  Stepwise multiple linear regression was employed to establish the predictors of students' academic self-concept.

3.4.2 Analyses and Research Questions

The analytical procedures 'for each of the specific research questions outlined in Section 2.8 were as follows:

(I) Comparisons of students' academic self-concept

(a) Overall sample

To answer research question (I)(a)(i), pertaining to developmental changes in students' academic self-concept, the mean scores of each academic self-concept factor, namely, the academic self-concept scale, students' confidence subscale and students' effort subscale, were computed for the overall sample at $time_0$, $time_1$, $time_2$ and $time_3$. They were subjected to the ANOVA of single factor repeated measures. If a significant time effect was detected for a factor, the scores were further subjected to the paired t-test to establish where the significant time effects lay. The repeated means of a factor came from the same cases and were less likely to differ than the means of unrelated samples, that is, different subgroups of students. Thus, the paired t-test (t-test for related samples) was used instead of the t-test because it accounted for the extent of the correlations amongst the means of the overall sample (Cramer, 1994). For each factor under consideration, four sets of paired t-tests were employed to evaluate pairwise differences between the scores at $time_0$ and $time_1$, $time_1$ and $time_2$, $time_2$ and $time_3$, and $time_0$ and $time_3$. Since each repeated pairwise comparison increased the chance of type I error, the level of significance was set at 0.01 level instead of 0.05 level. With the completion of the paired t-tests, any developmental changes in students' academic self-concept from Secondary 1 to Secondary 3 could be highlighted.

(b) Male and Female students

The aforementioned procedures were repeated for research questions (I)(b)(i) and (I)(b)(ii) to establish the developmental changes in male and female students' academic self-concept respectively.

To answer research question (I)(b)(iii), relating to subgroup comparison by gender of students' academic self-concept at each point in time, the male and female students' mean scores of each measure were subjected to the t-test. Thereafter, the mean scores of items in the measures with significant gender effects were isolated and subjected to further t-test. Thus, any difference between genders in students' academic self-concept in Secondary 1, 2 and 3 could be clearly identified.

To answer research question (I)(b)(iv), concerning subgroup comparison by gender of changes in students' academic self-concept over time, the male and female students' mean scores of each factor at $time_0$, $time_1$, $time_2$ and $time_3$ were subjected to the two-way ANOVA of single factor repeated measures. If a significant gender by time interaction effect was established, the changes in the factor scores over time of male and female students were computed independently and subjected to the t-test. For each relevant factor, four t-tests were carried out to examine the difference between genders on the changes in the factor scores from $time_0$ to $time_1$, $time_1$ to $time_2$, $time_2$ to $time_3$, and $time_0$ to $time_3$. Hence any gender effect on the changes in students' academic self-concept from Secondary 1 to Secondary 3 could be established.

(c) Express and Normal students

The procedures for research questions (I)(b) were repeated for research questions (I)(c) for the Express and Normal students.

(d) Lower Express and Higher Normal students

The Lower Express and Higher Normal students were identified with the help of the students' PSLE results. The Lower Express students were students whose PSLE results were in the lowest third of the Express sample. Their PSLE results ranged from 195 to 205. The Higher Normal students were students whose PSLE results were in the highest third of the Normal sample. Their PSLE results ranged from 179 to 187. Apart from the identification process, the analytical procedures of research questions (I)(d) for the Lower Express and Higher Normal students were identical to those of research questions (I)(b) and (I)(c).

For research questions (I)(b) to (I)(d), in addition to the aforementioned statistical tests, a series of MANOVA was conducted to check for interaction effects between subgroups. Thereafter, t-tests were carried out to evaluate pairwise differences between the relevant measures.

(II) Comparisons of students' perception of home environment

The procedures for research questions (I)(a) to (I)(d) were repeated on students' home environment factors for research questions (II)(a) to II(d).

(III) Comparisons of students' perception of classroom climate

Likewise, the procedures for research questions (I)(a) to (I)(d) were repeated on students' classroom climate factors for research questions (III)(a) to (III)(d).

(IV) Relationships between students' academic self-concept and their perceived home environment and classroom climate

(a) Overall sample

To answer research question (IV)(a), pertaining to relationships between students' academic self-concept and their perceived home environment and classroom climate, the Pearson product-moment correlation coefficients were computed for the overall sample at each point in time.

(b) Male and Female students

To answer research question (IV)(b), concerning subgroup comparison by gender of the aforementioned relationships, the Pearson product-moment correlation coefficients were calculated for male and female students independently at each point in time. Thereafter, the correlations were subjected to the Fisher's z_r transformation to determine the level of significance of the differences between genders. The Fisher's z_r transformation was calculated with the following equation:

$$z = \frac{z_{r1} - z_{r2}}{\sqrt{1/(N_1-3) + 1/(N_2 - 3)}}$$

where N_1 and N_2 are the sample sizes of subgroup_1 and subgroup_2, and z_{r1} and z_{r2} are the z_r values corresponding to the Pearson correlations r_1 and r_2 of the subgroups (Appendix 13).

The sampling distribution of z is a unit-normal-curve deviate, so for the correlations to be significantly different ($p<0.05$), the z value must be at least 1.96.

(c) Express and Normal students

The procedures for research question (IV)(b) were repeated on the Express and Normal students for research question (IV)(c).

(d) Lower Express and Higher Normal students

Likewise, the procedures for research question (IV)(b) were repeated on the Lower Express and Higher Normal students for research question (IV)(d).

(V) Predictors of students' academic self-concept

To answer research questions (V), relating to predictors of students' academic self-concept, regressions were performed independently for the overall sample, and the different subgroups of students on students' academic self-concept variables. Since the study was exploratory in purpose, it was decided that the stepwise regression method with the use of empirical procedures to determine entry of predictive variable into the regression models was more appropriate than the fixed-order regression method.

For each group of students, four sets of stepwise regressions were performed. The first and second sets looked at the academic self-concept main scales, and the third and fourth series focused on the academic self-concept subscales. Essentially, the four sets of regressions were:

Set 1: The dependent variables were the academic self-concept scales at $time_0$, $time_1$, $time_2$ and $time_3$, and the predictive variables were the present environmental scales, that is, the home environment and classroom climate scales measured in the same wave as the dependent variables.

Set 2: The dependent variables were the academic self-concept scales at $time_1$, $time_2$ and $time_3$, 'and the predictive variables were the past and present environmental scales, that is, the home environment and classroom climate scales measured prior to and in the same wave as the dependent variables.

Set 3: The dependent variables were the academic self-concept subscales at $time_0$, $time_1$, $time_2$ and $time_3$, and the predictive variables were the present environmental subscales, that is, the home environment and classroom climate subscales measured in the same wave as the dependent variables.

Set 4: The dependent variables were the academic self-concept subscales at $time_1$, $time_2$ and $time_3$, and the predictive variables were the past and present environmental subscales, that is, the home environment and classroom climate subscales measured prior to and in the same wave as the dependent variables.

To have a clear understanding about the predictive abilities of the environmental subscales as compared to that of other non-environmental variables, students' PSLE result, stream, gender, socio-economic status, non-verbal reasoning test score, and when appropriate, class positions were also entered as predictive variables in the third and fourth sets of regressions.

It will be recalled that the surveys at $time_1$, $time_2$ and $time_3$ were conducted before the students received their Secondary 1, 2 and 3 end-of-year examination results respectively. Thus, the timing entailed that Secondary 1 class position was only a predictive variable of students' Secondary 2 and 3 academic self-concepts, whilst Secondary 2 class position was only a predictive variable of students' Secondary 3 academic self-concept.

In view of the vast number of predictive variables, environmental and non-environmental, it was decided a priori that an additional contribution of 2% variance in students' academic self-concept would be considered to have practical significance (similar to Leonardson, 1986).

(VI) Additional subgroups comparisons

(a) Ability bands of students

The six ability bands were identified with the help of the students' PSLE results. The Higher Express, Middle Express and Lower Express students were students whose PSLE results were in the highest third, middle third and lowest third respectively of the Express sample. Their PSLE results ranged from 231 to 245 (N = 91), 206 to 230 (N = 94), and 195 to 205 (N = 90) respectively. The Higher Normal, Middle Normal and Lower Normal students were students whose PSLE results were in the highest third, middle third and lowest third respectively of the Normal sample.

Their PSLE results ranged from 179 to 187 (N = 66), 171 to 178 (N = 76), and 115 to 170 (N = 65) respectively.

To answer research question (VI)(a)(i), pertaining to subgroup comparisons by ability bands at each point in time, the mean scores of each measure were computed independently for the ability bands and subjected to a series of one-way ANOVA and Scheffe test. For every measure, the ANOVA and Scheffe test were conducted for the six ability bands, the three Express ability bands, and the three Normal ability bands. The Scheffe test was used instead of the t-test because the t-test does not account for experimentwise error rates and does not incorporate overall variance testing, so it is not suitable for comparisons on more than two subgroups (Youngman, 1979). In cases where the Scheffe test established significant subgroup effects, the mean scores of the items in the relevant measures were isolated and subjected to the t-test.

(b) Clusters of students

The centroid relocation method was used to identify clusters of students with comparable academic self-concept, and perceptions of home environment and classroom climate. In the procedure, each measure was standardised into a mean of 0 and a standard deviation of 1. The standardised means of the academic self-concept, home environment and classroom climate subscales were then employed as the clustering variables, and the dendrogram generated by the cluster analysis is given in Appendix 14.

Based on the dendrogram (see Appendix 14), it appeared worthwhile to look at the 4-cluster and 8-cluster solutions. However, the additional information obtained from the 8-cluster solution (Appendix 15) was marginal compared to that of the 4-cluster solution (Appendix 16). There was also a lack of clarity in terms of the overall pattern of variation of the eight clusters. In addition, cluster 8 had only eight students. It was an exceptionally small cluster as compared to other clusters, which contained between 48 to 79 students. Since the presence of small cluster could reduce the subsequent value of the solution (Youngman, 1979), it was decided that the study would focus on the 4-cluster solution.

After the 4-cluster solution was chosen, the students were divided into clusters 1, 2, 3 and 4. In order to have a better understanding of the research significance of the solution, the main characteristics of the clusters were compiled in terms of classificatory variables such as stream, gender, socio-economic status, PSLE result, non-verbal reasoning test score and Secondary 1 and 2 class positions. Thereafter, the developmental changes of the clusters over time, subgroup comparisons by cluster at each point in time, and subgroup comparisons by cluster in terms of their developmental changes over time were examined sequentially.

To answer research question (VI)(b)(i), pertaining to developmental changes of the clusters over time, the means and standardised means of the measures were isolated (from the cluster analysis output) for every cluster. In addition, for each cluster, the means of each factor at $time_0$, $time_1$, $time_2$ and $time_3$ were subjected to the ANOVA of single factor repeated measures to establish whether the developmental changes over time of the cluster was significant. Thereafter, the paired t-test was employed to find out where any significant time effects lay. Similar to that of other subgroups of students, four sets of paired t-tests were employed for each factor to evaluate pairwise comparisons of the means at $time_0$ and $time_1$, $time_1$ and $time_2$, $time_2$ and $time_3$, and $time_0$ and $time_3$. As noted earlier, due to the increased likelihood of type I error with the repeated pairwise comparisons, the level of significance was set at 0.01 level.

To answer research question (VI)(b)(ii), relating to subgroup comparisons by cluster at each point in time, the means of each measure of the clusters were subjected to the one-way ANOVA. Thereafter, the Scheffe test was employed to ascertain which differences between the clusters were significant.

Finally, to answer research question (VI)(b)(iii), concerning subgroup comparisons by cluster in terms of their developmental changes over time, the means of each factor at $time_0$, $time_1$, $time_2$ and $time_3$ of the clusters were subjected to the two-way ANOVA of single factor repeated measures. If a significant cluster by time interaction effect was detected, the changes of the factor scores from $time_0$ to $time_1$, $time_1$ to $time_2$, $time_2$ to $time_3$, and $time_0$ to $time_3$ were computed for the clusters and subjected to the Scheffe test to find out where the significant differences lay.

3.4.3 Summary of Statistical Analyses

A summary of the statistical analyses employed in this study for research questions (I) to (VI) is given as shown in Table 3.4.1.

Table 3.4.1: Summary of statistical analyses

Research Questions	Nature of Query	Statistical Analyses
I, II, III	▪ Developmental changes	- ANOVA of single factor repeated measures - Paired t-test
	▪ Subgroup comparisons	- T-test on each measure - T-test on items
	▪ Subgroup comparisons of developmental changes	- Two-way ANOVA of single factor repeated measures - T-test on changes of factor over time
IV	▪ Relationships	- Pearson correlation coefficient
	▪ Subgroup comparisons of relationships	- Fisher's z_r transformation
V	▪ Predictors of academic self-concept	- Stepwise multiple linear regression
VI	(a) Ability bands ▪ Subgroup comparisons	- One-way ANOVA and Scheffe test on each measure - T-test on items
	(b) Clusters ▪ Developmental changes	- ANOVA of single factor repeated measures - Paired t-test
	▪ Subgroup comparisons	- One-way ANOVA and Scheffe test
	▪ Subgroup comparisons of developmental changes	- Two-way ANOVA of single factor repeated measures - Scheffe test on changes of factor over time

Chapter Four

Results

This chapter presents the results of the data analyses. They are organised according to the specific research questions outlined in Section 2.8, that is

4.1 Comparison of Students' Academic Self-Concept;

4.2 Comparison of Students' Perception of Home Environment;

4.3 Comparison of Students' Perception of Classroom Climate;

4.4 Relationships between Students' Academic Self-Concept and their Perceived Home Environment and Classroom Climate;

4.5 Predictors of Students' Academic Self-Concept; and

4.6 Additional Subgroups Comparisons.

The results in Section 4.1 to Section 4.5 are further divided into five subsections. They are overall sample, male and female students, Express and Normal students, Lower Express and Higher Normal students, and summary of key findings. The results in Section 4.6 are further organised into two subsections. They are ability bands of students, and clusters of students.

It is noteworthy that when the responses of the four socio-economic status subgroups were analysed by the one-way ANOVA and the Scheffe test, the results revealed only one significant difference ($p<0.05$) between them in their academic self-concept, and their perceived home environment and classroom climate. Specifically, the 'unskilled occupations' group (mean = 3.512, SD = 0.334) had significantly higher score for the teachers' expectations subscale at $time_1$ than the 'semi-skilled occupations' group (mean = 3.333, SD = 0.390). The lack of substantial subgroup differences confirmed that the subgroups were highly comparable in terms of their academic self-concept and their perceived home environment and classroom climate, thus justifying the decision to exclude socio-economic status as a variable in subgroup comparisons.

The raw data is given in Appendix 17.

4.1 Comparison of Students' Academic Self-Concept

The data analysis in this section was tailored to answer three broad categories of research questions pertaining to students' academic self-concept, namely, developmental changes over time, subgroup comparisons at each point in time, and subgroup comparisons of changes over time (see Section 2.8). The developmental changes were examined sequentially for the overall sample, male and female students, Express and Normal students, and Lower Express and Higher Normal students. The subgroup comparisons were conducted between male and female students, Express and Normal students, and Lower Express and Higher Normal students.

4.1.1 Overall Sample

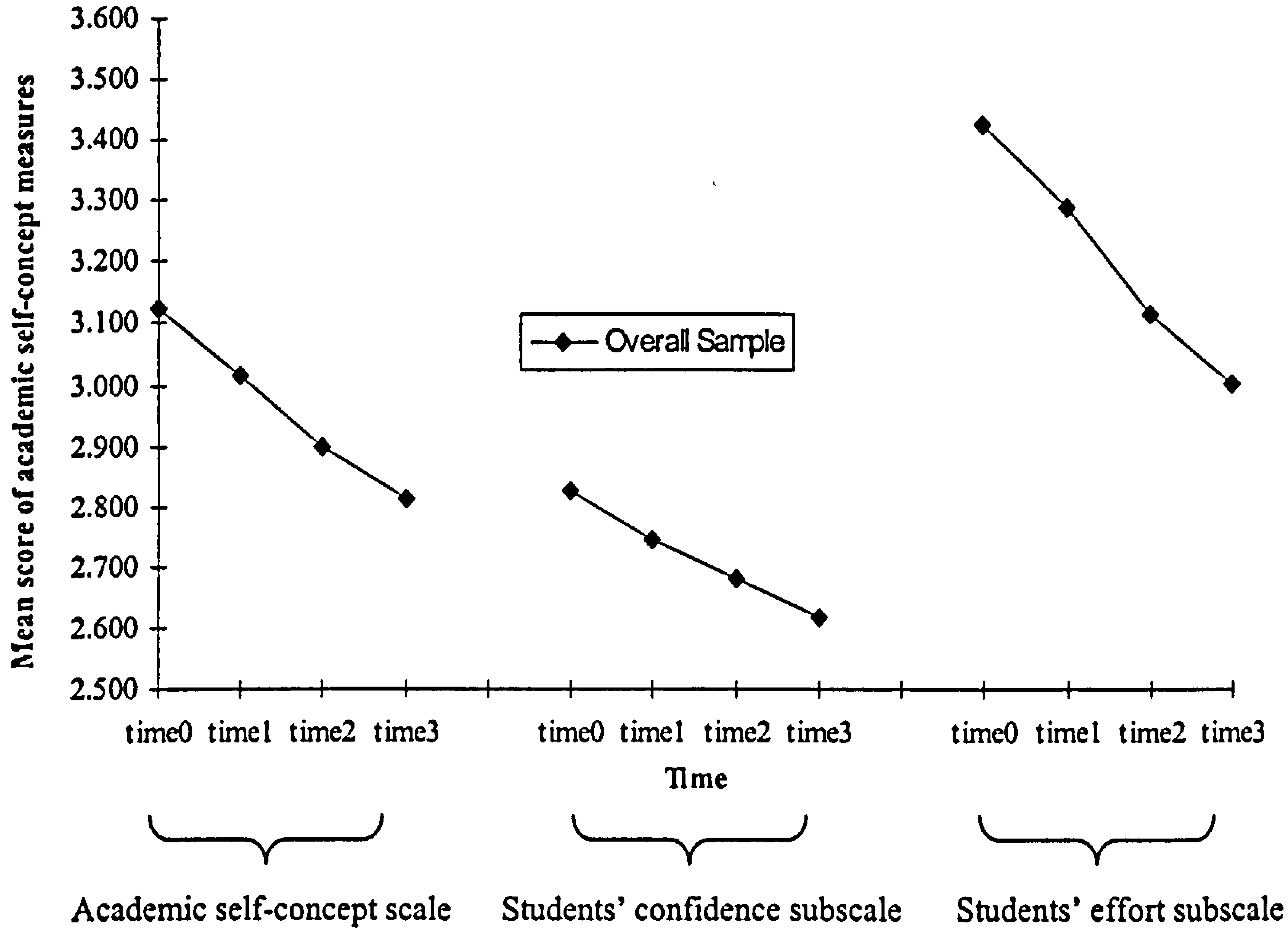
Developmental changes in students' academic self-concept

To establish the developmental changes in students' academic self-concept, the scores of the overall sample's academic self-concept measures at $time_0$, $time_1$, $time_2$ and $time_3$ were computed and subjected to the ANOVA of single factor repeated measures. The analysis revealed significant differences at 0.001 levels between the scores of repeated measures of the academic self-concept scale, students' confidence subscale and student's effort subscale. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test to evaluate pairwise differences between the measures. The results obtained are tabulated in Table 4.1.1 and illustrated in Figure 4.1.1.

Table 4.1.1: Paired t-test on students' academic self-concept scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Academic Self-Concept	$Time_0$ $Time_1$	3.123 3.015	0.108	0.319	$p<0.001$
	$Time_1$ $Time_2$	3.015 2.898	0.117	0.311	$p<0.001$
	$Time_2$ $Time_3$	2.898 2.811	0.087	0.332	$p<0.001$
	$Time_0$ $Time_3$	3.123 2.811	0.312	0.395	$p<0.001$
(a) Students' Confidence	$Time_0$ $Time_1$	2.825 2.743	0.082	0.385	$p<0.001$
	$Time_1$ $Time_2$	2.743 2.680	0.063	0.359	$p<0.001$
	$Time_2$ $Time_3$	2.680 2.618	0.062	0.389	$p<0.001$
	$Time_0$ $Time_3$	2.825 2.618	0.207	0.461	$p<0.001$
(b) Students' Effort	$Time_0$ $Time_1$	3.422 3.286	0.136	0.371	$p<0.001$
	$Time_1$ $Time_2$	3.286 3.115	0.171	0.382	$p<0.001$
	$Time_2$ $Time_3$	3.115 3.004	0.111	0.393	$p<0.001$
	$Time_0$ $Time_3$	3.422 3.004	0.418	0.453	$p<0.001$

Figure 4.1.1: Students' academic self-concept scores over time



The results in Table 4.1.1 revealed that the scores of the students' academic self-concept measures were reasonably high. However, they decreased significantly for each of the 1-year intervals over the three years and the overall 3-year period.

4.1.2 Male and Female Students

Developmental changes in male students' academic self-concept

The scores of the male students' academic self-concept measures were likewise computed and subjected to the ANOVA of single factor repeated measures. The analysis established significant time effects at 0.001 levels on the scores of the repeated measures of academic self-concept scale and subscales. To find out where the significant differences lay, the scores of the measures were further subjected to the paired t-test. The results obtained are given in Table 4.1.2.

Table 4.1.2: Paired t-test on male students' academic self-concept scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Academic Self-Concept	$Time_0$ $Time_1$	3.104 3.001	0.103	0.324	p<0.001
	$Time_1$ $Time_2$	3.001 2.888	0.113	0.348	p<0.001
	$Time_2$ $Time_3$	2.888 2.797	0.091	0.344	p<0.001
	$Time_0$ $Time_3$	3.104 2.797	0.307	0.394	p<0.001
(a) Students' Confidence	$Time_0$ $Time_1$	2.831 2.762	0.069	0.408	p<0.01
	$Time_1$ $Time_2$	2.762 2.717	0.045	0.395	-
	$Time_2$ $Time_3$	2.717 2.646	0.071	0.401	p<0.01
	$Time_0$ $Time_3$	2.831 2.646	0.185	0.451	p<0.001
(b) Students' Effort	$Time_0$ $Time_1$	3.377 3.239	0.138	0.364	p<0.001
	$Time_1$ $Time_2$	3.239 3.060	0.179	0.423	p<0.001
	$Time_2$ $Time_3$	3.060 2.948	0.112	0.419	p<0.001
	$Time_0$ $Time_3$	3.377 2.948	0.429	0.467	p<0.001

Table 4.1.2 revealed that the results of the male students were similar to that of the overall sample. Essentially, the scores of the academic self-concept measures were reasonably high, and they decreased significantly for the overall 3-year period and for all except one of the 1-year intervals.

Developmental changes in female students' academic self-concept

The aforementioned procedures of the male students were repeated for the female students. The ANOVA of single factor repeated measures again established significant time effects at 0.001 levels on the scores of repeated measures of the academic self-concept scale and subscales. Thus, the scores of the measures were further subjected to the paired t-test and the results are tabulated in Table 4.1.3.

Table 4.1.3: Paired t-test on female students' academic self-concept scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Academic Self-Concept	$Time_0$ $Time_1$	3.144 3.030	0.114	0.314	$p<0.001$
	$Time_1$ $Time_2$	3.030 2.907	0.123	0.267	$p<0.001$
	$Time_2$ $Time_3$	2.907 2.826	0.081	0.319	$p<0.001$
	$Time_0$ $Time_3$	3.144 2.826	0.318	0.397	$p<0.001$
(a) Students' Confidence	$Time_0$ $Time_1$	2.818 2.724	0.094	0.358	$p<0.001$
	$Time_1$ $Time_2$	2.724 2.640	0.084	0.315	$p<0.001$
	$Time_2$ $Time_3$	2.640 2.589	0.051	0.376	-
	$Time_0$ $Time_3$	2.818 2.589	0.229	0.471	$p<0.001$
(b) Students' Effort	$Time_0$ $Time_1$	3.470 3.335	0.135	0.379	$p<0.001$
	$Time_1$ $Time_2$	3.335 3.174	0.161	0.335	$p<0.001$
	$Time_2$ $Time_3$	3.174 3.063	0.111	0.365	$p<0.001$
	$Time_0$ $Time_3$	3.470 3.063	0.407	0.438	$p<0.001$

From Table 4.1.3, it is evident that the results of the female students were similar to those of the overall sample and the male students. In this case, the scores of the academic self-concept measures were reasonably high, and they decreased significantly for the overall 3-year period and for all except one of the 1-year intervals.

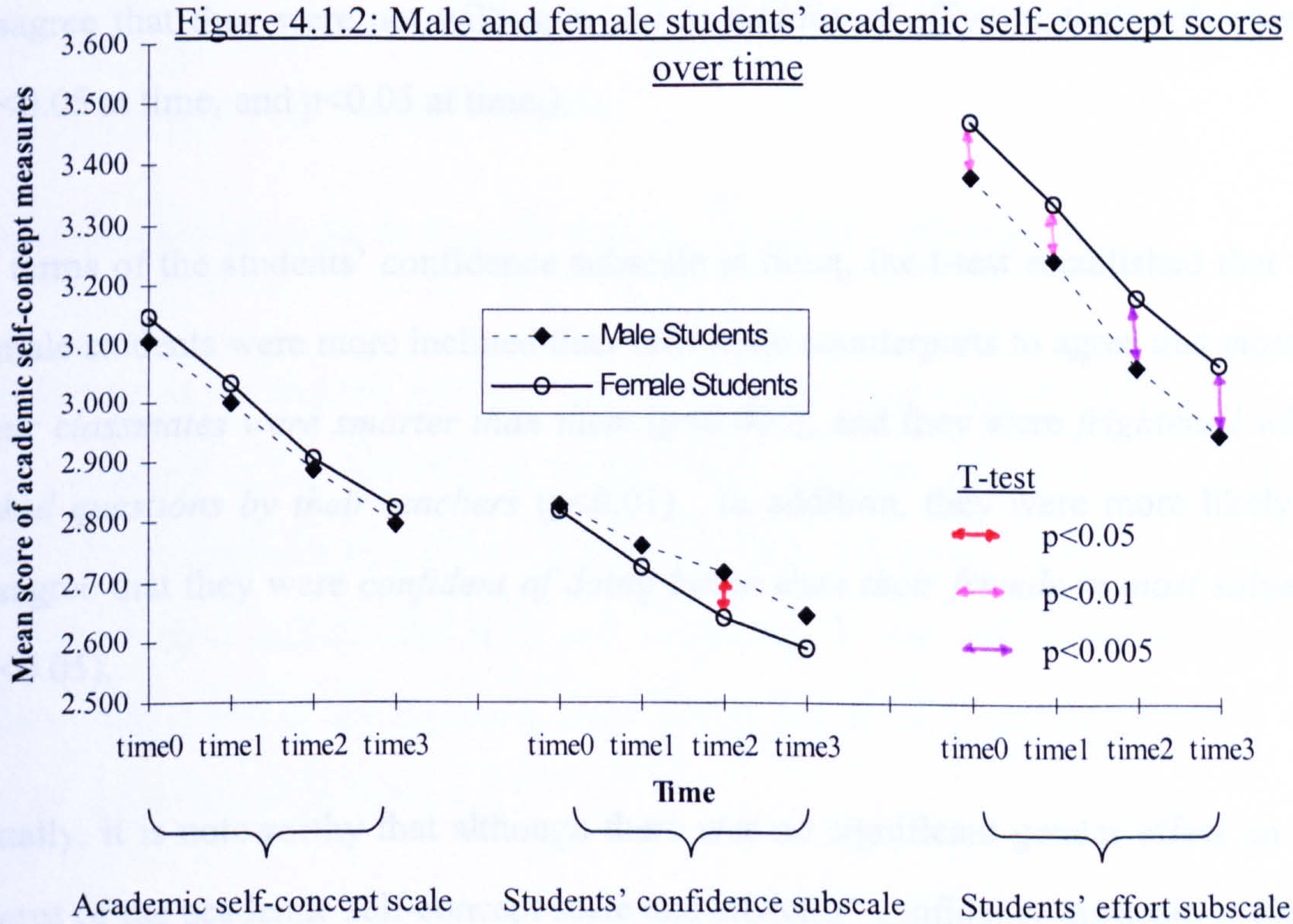
Subgroup comparisons of students' academic self-concept

In order to ascertain whether there was any significant difference between genders, the scores of the male and female students' academic self-concept measures were subjected to the t-test for independent samples at different points in time, namely, $time_0$, $time_1$, $time_2$ and $time_3$. The results are tabulated in Table 4.1.4 and illustrated in Figure 4.1.2.

Table 4.1.4: T-test on male and female students' academic self-concept scores

Variable	Time	Gender	Mean	SD	Level of Sign.
Academic Self-Concept	$Time_0$	Male	3.104	0.327	-
	$Time_0$	Female	3.144	0.315	
	$Time_1$	Male	3.001	0.367	-
	$Time_1$	Female	3.030	0.333	
	$Time_2$	Male	2.888	0.365	-
	$Time_2$	Female	2.907	0.337	
	$Time_3$	Male	2.797	0.376	-
	$Time_3$	Female	2.826	0.374	
(a) Students' Confidence	$Time_0$	Male	2.831	0.377	-
	$Time_0$	Female	2.818	0.354	
	$Time_1$	Male	2.762	0.434	-
	$Time_1$	Female	2.724	0.372	
	$Time_2$	Male	2.717	0.396	$p<0.05$
	$Time_2$	Female	2.640	0.376	
	$Time_3$	Male	2.646	0.416	-
	$Time_3$	Female	2.589	0.418	
(b) Students' Effort	$Time_0$	Male	3.377	0.387	$p<0.01$
	$Time_0$	Female	3.470	0.363	
	$Time_1$	Male	3.239	0.397	$p<0.01$
	$Time_1$	Female	3.335	0.379	
	$Time_2$	Male	3.060	0.429	$p<0.005$
	$Time_2$	Female	3.174	0.383	
	$Time_3$	Male	2.948	0.424	$p<0.005$
	$Time_3$	Female	3.063	0.416	

Figure 4.1.2: Male and female students' academic self-concept scores over time



The results revealed no significant gender effect on the scores of the academic self-concept scale. However, the female students had significantly lower score for the students' confidence subscale at $time_2$ than their male counterparts. They also had significantly higher scores for the students' effort subscales at $time_0$, $time_1$, $time_2$ and $time_3$ than the male students.

In view of the significant gender effects, the students' responses to the items of the aforementioned subscales were isolated and subjected to the t-test (Appendix 18).

The t-test revealed that for the students' effort subscales, the female students were more positive than their male counterparts about *paying attention to their teachers during lessons* ($p<0.05$ at $time_0$ and $p<0.01$ at $time_3$). They were more inclined to disagree that they *always waited for lessons to end* ($p<0.005$ at $time_0$ and $p<0.005$ at $time_1$), and they *daydreamed a lot in class* ($p<0.01$ at $time_1$ and $p<0.005$ at $time_3$). Likewise, they were more likely to disagree that they *often felt like quitting schools* ($p<0.05$ at $time_2$ and $p<0.01$ at $time_3$), and they *did their homework without thinking* ($p<0.05$ at $time_2$ and $p<0.05$ at $time_3$). In addition, they were more inclined to disagree that they were not willing *to put in additional effort in their schoolwork* ($p<0.05$ at $time_1$ and $p<0.05$ at $time_3$).

In terms of the students' confidence subscale at $time_2$, the t-test established that the female students were more inclined than their male counterparts to agree that *most of their classmates were smarter than them* ($p<0.005$), and they were *frightened when asked questions by their teachers* ($p<0.01$). In addition, they were more likely to disagree that they were *confident of doing better than their friends in most subjects* ($p<0.05$).

Finally, it is noteworthy that although there was no significant gender effect on the scores of the academic self-concept scale and students' confidence subscale at $time_0$, there were significant interaction effects (Appendix 19). Specifically, the t-test revealed that the Express female students had significantly higher score for the academic self-concept scale than the Express male students, while the Normal male students had significantly higher score for the students' confidence subscale than the Normal female students.

Subgroup comparisons of changes in students' academic self-concept over time

As noted in the earlier part of Section 4.1.2, the male and female students' academic self-concept decreased significantly over time. In an attempt to ascertain whether the declines were similar for both genders, the scores of the measures were subjected to the two-way ANOVA of single factor repeated measures. The analysis was of a mixed design, where comparisons were carried out within subject (repeated measures) and between subjects (male and female students). The ANOVA did not detect any significant gender by time interaction effect on the scores of the academic self-concept scale and subscales, thus establishing that there was no significant difference between genders in the changes in their academic self-concept over time.

4.1.3 Express and Normal Students

Developmental changes in Express students' academic self-concept

The scores of the Express students' academic self-concept measures were computed and subjected to the ANOVA of single factor repeated measures. The analysis established significant time effects at 0.001 levels on the scores of repeated measures of the academic self-concept scale and subscales. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test. The results are tabulated in Table 4.1.5.

Table 4.1.5: Paired t-test on Express students' academic self-concept scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Academic Self-Concept	$Time_0$ $Time_1$	3.152 3.016	0.136	0.311	p<0.001
	$Time_1$ $Time_2$	3.016 2.897	0.119	0.320	p<0.001
	$Time_2$ $Time_3$	2.897 2.782	0.115	0.314	p<0.001
	$Time_0$ $Time_3$	3.152 2.782	0.370	0.391	p<0.001
(a) Students' Confidence	$Time_0$ $Time_1$	2.850 2.756	0.094	0.373	p<0.001
	$Time_1$ $Time_2$	2.756 2.682	0.074	0.355	p<0.001
	$Time_2$ $Time_3$	2.682 2.579	0.103	0.376	p<0.001
	$Time_0$ $Time_3$	2.850 2.579	0.271	0.455	p<0.001
(b) Students' Effort	$Time_0$ $Time_1$	3.454 3.275	0.179	0.357	p<0.001
	$Time_1$ $Time_2$	3.275 3.113	0.162	0.382	p<0.001
	$Time_2$ $Time_3$	3.113 2.985	0.128	0.371	p<0.001
	$Time_0$ $Time_3$	3.454 2.985	0.469	0.446	p<0.001

From Table 4.1.5, it is apparent that the results of the Express students were similar to those of the overall sample in that the scores of the academic self-concept measures were reasonably high, and they decreased significantly for each of the 1-year intervals and the overall 3-year period.

Developmental changes in Normal students' academic self-concept

The aforementioned procedures of the Express students were repeated for the Normal students. In this case, the ANOVA of single factor repeated measures likewise established significant time effects at 0.001 level on the scores of repeated measures of the academic self-concept scale and subscales. As such, the scores of the measures were further subjected to the paired t-test. The results obtained are tabulated in Table 4.1.6.

Table 4.1.6: Paired t-test on Normal students' academic self-concept scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Academic Self-Concept	$Time_0$ $Time_1$	3.085 3.013	0.072	0.327	p<0.005
	$Time_1$ $Time_2$	3.013 2.898	0.115	0.299	p<0.001
	$Time_2$ $Time_3$	2.898 2.850	0.048	0.353	-
	$Time_0$ $Time_3$	3.085 2.850	0.235	0.387	p<0.001
(a) Students' Confidence	$Time_0$ $Time_1$	2.792 2.726	0.066	0.400	-
	$Time_1$ $Time_2$	2.726 2.677	0.049	0.363	-
	$Time_2$ $Time_3$	2.677 2.671	0.006	0.400	-
	$Time_0$ $Time_3$	2.792 2.671	0.121	0.456	p<0.001
(b) Students' Effort	$Time_0$ $Time_1$	3.379 3.300	0.079	0.382	p<0.005
	$Time_1$ $Time_2$	3.300 3.118	0.182	0.383	p<0.001
	$Time_2$ $Time_3$	3.118 3.029	0.089	0.421	p<0.005
	$Time_0$ $Time_3$	3.379 3.029	0.350	0.455	p<0.001

Table 4.1.6 revealed that the general trend of the Normal students' academic self-concept was similar to that of the overall sample and the Express students. Essentially, the scores of the measures were reasonably high, and they decreased over time. However, four of the declines over the 1-year intervals, including all those for the scores of the students' confidence subscale, were not significant.

Subgroup comparisons of students' academic self-concept

To determine whether there was any significant difference between streams, the scores of the Express and Normal students' academic self-concept measures were subjected to the t-test at different points in time, namely, $time_0$, $time_1$, $time_2$ and $time_3$. The results are given in Table 4.1.7 and illustrated in Figure 4.1.3.

Table 4.1.7: T-test on Express and Normal students' academic self-concept scores

Variable	Time	Stream	Mean	SD	Level of Sign.
Academic Self-Concept	$Time_0$	Express	3.152	0.321	$p<0.05$
	$Time_0$	Normal	3.085	0.320	
	$Time_1$	Express	3.016	0.351	-
	$Time_1$	Normal	3.013	0.351	
	$Time_2$	Express	2.897	0.371	-
	$Time_2$	Normal	2.898	0.324	
	$Time_3$	Express	2.782	0.372	$p<0.05$
	$Time_3$	Normal	2.850	0.377	
(a) Students' Confidence	$Time_0$	Express	2.850	0.363	-
	$Time_0$	Normal	2.792	0.367	
	$Time_1$	Express	2.756	0.407	-
	$Time_1$	Normal	2.726	0.402	
	$Time_2$	Express	2.682	0.404	-
	$Time_2$	Normal	2.677	0.367	
	$Time_3$	Express	2.579	0.422	$p<0.05$
	$Time_3$	Normal	2.671	0.406	
(b) Students' Effort	$Time_0$	Express	3.454	0.375	$p<0.05$
	$Time_0$	Normal	3.379	0.379	
	$Time_1$	Express	3.275	0.388	-
	$Time_1$	Normal	3.300	0.395	
	$Time_2$	Express	3.113	0.420	-
	$Time_2$	Normal	3.118	0.400	
	$Time_3$	Express	2.985	0.414	-
	$Time_3$	Normal	3.029	0.435	

Figure 4.1.3: Express and Normal students' academic self-concept scores over time

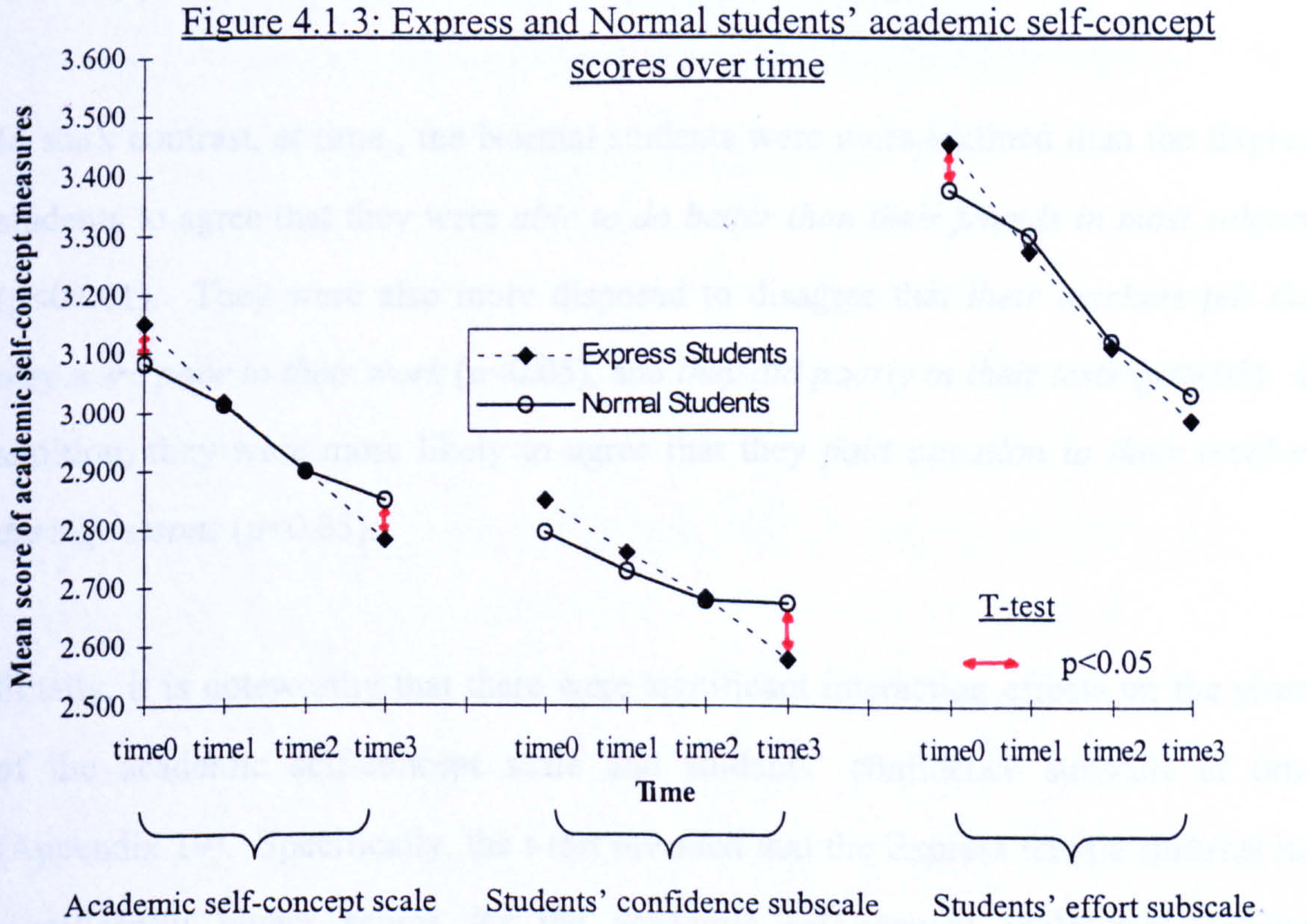


Table 4.1.7 revealed that the Express students had significantly higher scores for the academic self-concept scale and students' effort subscale at $time_0$ than the Normal students. In stark contrast, the Normal students had higher scores for the academic self-concept scale and students' confidence subscale at $time_3$ than their Express counterparts.

On the basis of the significant stream effects, the Express and Normal students' responses to the items in the academic self-concept scale and students' effort subscale at $time_0$, as well as the academic self-concept scale and students' confidence subscale at $time_3$ were isolated and subjected to the t-test (Appendix 20).

The t-test revealed that among the numerous differences at $time_0$, the Normal students were more inclined than the Express students to disagree that they were *able to do better than their friends in most subjects* ($p<0.05$). .They were also more likely to agree that they *did poorly in their tests* ($p<0.001$), and *their teachers felt that they were poor in their work* ($p<0.05$). In addition, they were more disposed to disagree that they *paid attention to their teachers during lessons* ($p<0.05$).

In stark contrast, at $time_3$, the Normal students were more inclined than the Express students to agree that they were *able to do better than their friends in most subjects* ($p<0.001$). They were also more disposed to disagree that *their teachers felt that they were poor in their work* ($p<0.05$), and *they did poorly in their tests* ($p<0.05$). In addition, they were more likely to agree that they *paid attention to their teachers during lessons* ($p<0.05$).

Finally, it is noteworthy that there were significant interaction effects on the scores of the academic self-concept scale and students' confidence subscale at $time_0$ (Appendix 19). Specifically, the t-test revealed that the Express female students had significantly higher scores for the academic self-concept scale and students' confidence subscale than the Normal female students. In contrast, the Express male students and Normal male students had comparable scores. As such, the stream effect on the scores of the academic self-concept scale at $time_0$ was primarily due to the significant difference between the female students in the two streams ($p<0.001$, Appendix 20).

Subgroup comparisons of changes in students' academic self-concept over time

Although the Express and Normal students' academic self-concept decreased over time, there was an indication that the declines could be less pronounced for the Normal students than the Express students. To determine whether the differences in the declines were significant, the scores of the Express and Normal students' measures were subjected to the two-way ANOVA of single factor repeated measures. The results demonstrated significant stream by time interaction effects on the scores of the academic self-concept scale ($p<0.001$), students' confidence subscale ($p<0.001$), and students' effort subscale ($p<0.01$). In view of the significant interaction effects, the changes in the scores of the measures over time were computed independently for the Express and Normal students and subjected to the t-test (see Table 4.1.8 on the following page).

The results, as shown in Table 4.1.8, revealed that the declines of the scores of the Normal students' academic self-concept measures in many instances were significantly less than that of the Express students.

Table 4.1.8: T-test on the changes in Express and Normal students' academic self-concept scores over time

Variable	Time	Stream	Mean	Paired Diff	Level of Sign.
Academic Self-Concept	$Time_0$ - $Time_1$	Express	3.152 - 3.016	0.136	p<0.05
		Normal	3.085 - 3.013	0.072	
	$Time_1$ - $Time_2$	Express	3.016 - 2.897	0.119	-
		Normal	3.013 - 2.898	0.115	
	$Time_2$ - $Time_3$	Express	2.897 - 2.782	0.115	p<0.05
		Normal	2.898 - 2.850	0.048	
	$Time_0$ - $Time_3$	Express	3.152 - 2.782	0.370	p<0.001
		Normal	3.085 - 2.850	0.235	
(a) Students' Confidence	$Time_0$ - $Time_1$	Express	2.850 -2.756	0.094	-
		Normal	2.792 - 2.726	0.066	
	$Time_1$ - $Time_2$	Express	2.756 - 2.682	0.074	-
		Normal	2.726 - 2.677	0.049	
	$Time_2$ - $Time_3$	Express	2.682 - 2.579	0.103	p<0.01
		Normal	2.677 - 2.671	0.006	
	$Time_0$ - $Time_3$	Express	2.850 - 2.579	0.271	p<0.001
		Normal	2.792 - 2.671	0.121	
(b) Students' Effort	$Time_0$ - $Time_1$	Express	3.454 - 3.275	0.179	p<0.005
		Normal	3.379 - 3.300	0.079	
	$Time_1$ - $Time_2$	Express	3.275 - 3.113	0.162	-
		Normal	3.300 - 3.118	0.182	
	$Time_2$ - $Time_3$	Express	3.113 - 2.985	0.128	-
		Normal	3.118 - 3.029	0.089	
	$Time_0$ - $Time_3$	Express	3.454 - 2.985	0.469	p<0.005
		Normal	3.379 - 3.029	0.350	

4.1.4 Lower Express and Higher Normal Students

Developmental changes in Lower Express students' academic self-concept

The scores of the Lower Express students' academic self-concept measures were computed and subjected to the ANOVA of single factor repeated measures. The results established significant time effects at 0.001 levels on the scores of repeated measures of the academic self-concept scale and subscales. On the basis of the significant time effects, the scores of the measures were further subjected to the paired t-test. The results are given in Table 4.1.9.

Table 4.1.9: Paired t-test on Lower Express students' academic self-concept scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Academic Self-Concept	$Time_0$ $Time_1$	3.154 3.009	0.145	0.315	$p<0.001$
	$Time_1$ $Time_2$	3.009 2.870	0.139	0.353	$p<0.001$
	$Time_2$ $Time_3$	2.870 2.768	0.102	0.349	$p<0.01$
	$Time_0$ $Time_3$	3.154 2.768	0.386	0.435	$p<0.001$
(a) Students' Confidence	$Time_0$ $Time_1$	2.824 2.738	0.086	0.358	-
	$Time_1$ $Time_2$	2.738 2.653	0.085	0.401	-
	$Time_2$ $Time_3$	2.653 2.557	0.096	0.382	-
	$Time_0$ $Time_3$	2.824 2.557	0.267	0.487	$p<0.001$
(b) Students' Effort	$Time_0$ $Time_1$	3.484 3.280	0.204	0.352	$p<0.001$
	$Time_1$ $Time_2$	3.280 3.087	0.193	0.395	$p<0.001$
	$Time_2$ $Time_3$	3.087 2.980	0.107	0.410	-
	$Time_0$ $Time_3$	3.484 2.980	0.504	0.487	$p<0.001$

The results, as shown in Table 4.1.9, revealed that the general trend of the Lower Express students' academic self-concept was not unlike that of the overall sample in that the scores of the measures were quite high, and they declined over time. In this case, however, four of the declines, including all those for the scores of the students' confidence subscale, were not significant.

Developmental changes in Higher Normal students' academic self-concept

The aforementioned procedures of the Lower Express students were repeated for the Higher Normal students. However, in contrast to that of the Lower Express students, the ANOVA of single factor repeated measures only established significant time effects at 0.001 levels on the scores of repeated measures of the academic self-concept scale and students' effort subscale. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test. The results are given in Table 4.1.10.

Table 4.1.10: Paired t-test on Higher Normal students' academic self-concept scores

Variable	Time	Mean	Paired Different Mean	Paired Different SD	Level of Sign.
Academic Self-Concept	$Time_0$ $Time_1$	3.049 2.999	0.050	0.304	-
	$Time_1$ $Time_2$	2.999 2.866	0.133	0.328	$p<0.005$
	$Time_2$ $Time_3$	2.866 2.892	-0.026	0.434	-
	$Time_0$ $Time_3$	3.049 2.892	0.157	0.385	$p<0.005$
(a) Students' Confidence *	$Time_0$ $Time_1$	2.761 2.686	0.075	0.401	-
	$Time_1$ $Time_2$	2.686 2.648	0.038	0.398	-
	$Time_2$ $Time_3$	2.648 2.700	-0.052	0.474	-
	$Time_0$ $Time_3$	2.761 2.700	0.061	0.448	-
(b) Students' Effort	$Time_0$ $Time_1$	3.336 3.311	0.025	0.343	-
	$Time_1$ $Time_2$	3.311 3.083	0.228	0.430	$p<0.001$
	$Time_2$ $Time_3$	3.083 3.083	0.000	0.521	-
	$Time_0$ $Time_3$	3.336 3.083	0.253	0.483	$p<0.001$

Note:
* ANOVA not significant

Table 4.1.10 revealed that the general pattern of the Higher Normal students' academic self-concept was less consistent with that of the overall sample than other subgroups of students. Essentially, although the declines for the overall 3-year period were significant for the scores of the academic self-concept scale and students' effort subscale, most of the declines for the 1-year intervals were not significant.

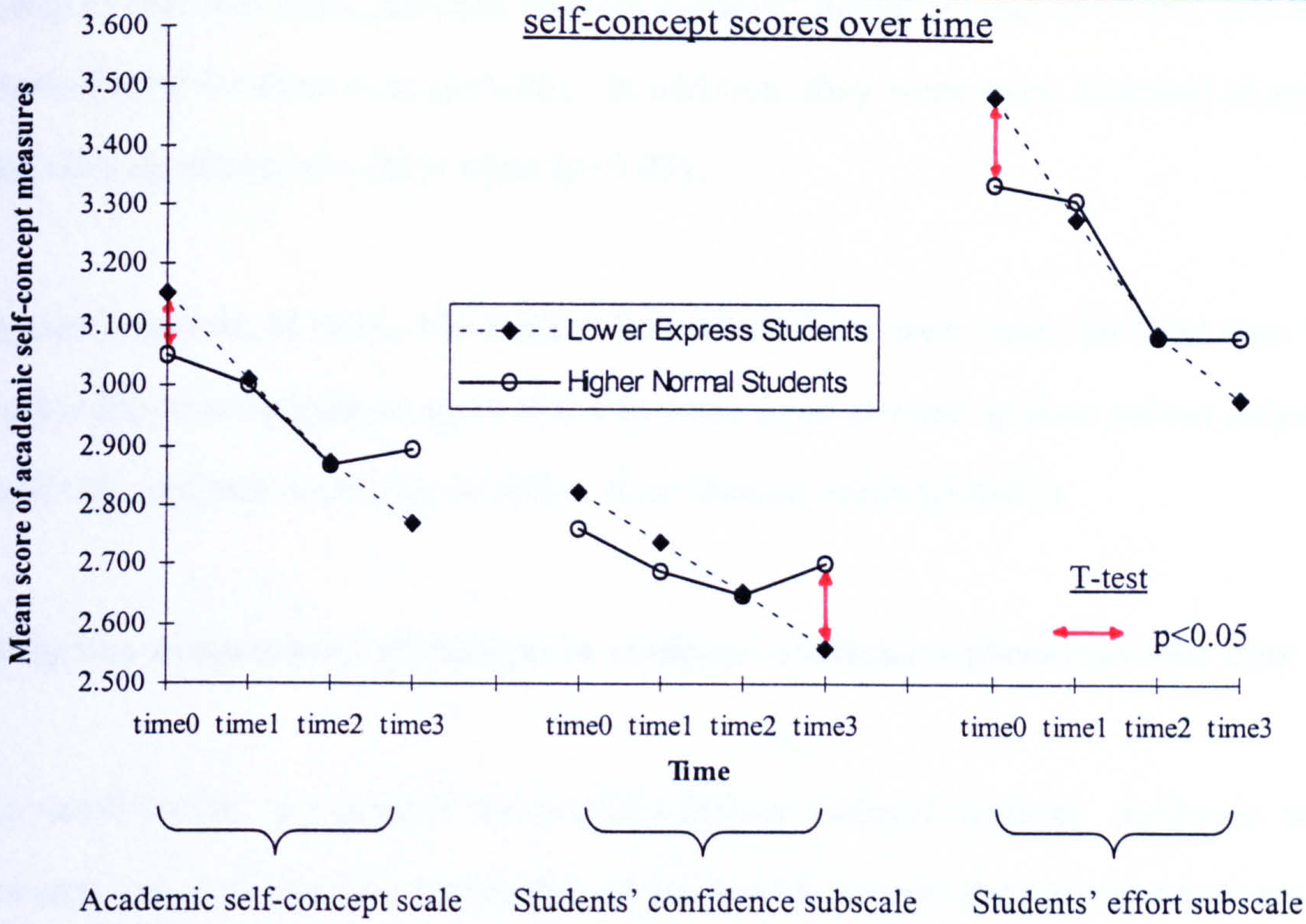
Subgroup comparisons of students' academic self-concept

To determine whether there was any significant difference between the Lower Express and Higher Normal students' academic self-concept, the scores of the academic self-concept measures of the two subgroups of students were subjected to the t-test at different points in time. The results are given in Table 4.1.11 and illustrated in Figure 4.1.4.

Table 4.1.11: T-test on Lower Express and Higher Normal students' academic self-concept scores

Variable	Time	Stream	Mean	SD	Level of Sign.
Academic Self-Concept	$Time_0$	Lower Express	3.154	0.319	$p<0.05$
	$Time_0$	Higher Normal	3.049	0.297	
	$Time_1$	Lower Express	3.009	0.400	-
	$Time_1$	Higher Normal	2.999	0.314	
	$Time_2$	Lower Express	2.870	0.435	-
	$Time_2$	Higher Normal	2.866	0.356	
	$Time_3$	Lower Express	2.768	0.430	-
	$Time_3$	Higher Normal	2.892	0.388	
(a) Students' Confidence	$Time_0$	Lower Express	2.824	0.376	-
	$Time_0$	Higher Normal	2.761	0.339	
	$Time_1$	Lower Express	2.738	0.459	-
	$Time_1$	Higher Normal	2.686	0.372	
	$Time_2$	Lower Express	2.653	0.463	-
	$Time_2$	Higher Normal	2.648	0.344	
	$Time_3$	Lower Express	2.557	0.449	$p<0.05$
	$Time_3$	Higher Normal	2.700	0.389	
(b) Students' Effort	$Time_0$	Lower Express	3.484	0.343	$p<0.05$
	$Time_0$	Higher Normal	3.336	0.385	
	$Time_1$	Lower Express	3.280	0.426	-
	$Time_1$	Higher Normal	3.311	0.355	
	$Time_2$	Lower Express	3.087	0.471	-
	$Time_2$	Higher Normal	3.083	0.470	
	$Time_3$	Lower Express	2.980	0.486	-
	$Time_3$	Higher Normal	3.083	0.479	

Figure 4.1.4: Lower Express and Higher Normal students' academic self-concept scores over time



The results, as shown in Figure 4.1.4, were similar to that of the Express and Normal students (refer to Figure 4.1.3). In this case, the Lower Express students had significantly higher scores for the academic self-concept scale and students' effort subscale at $time_0$ than the Higher Normal students. However, the Higher Normal students had significantly higher score for the students' confidence subscale at $time_3$ than their Lower Express counterparts.

In the light of the significant differences between the two subgroups of students, the students' responses to the items in the academic self-concept scale and students' effort subscale at $time_0$, and students' confidence subscale at $time_3$ were isolated and subjected to the t-test (Appendix 21).

The t-test showed that among the significant differences at $time_0$, the Higher Normal students were more inclined than the Lower Express students to disagree that *they were good in most of their school subjects* ($p<0.05$). They were also more likely to disagree that *they paid attention to their teachers during lessons* ($p<0.05$), and *they studied hard for their tests* ($p<0.05$). In addition, they were more disposed to agree that *they daydreamed a lot in class* ($p<0.05$).

In stark contrast, at $time_3$, the Higher Normal students were more inclined than the Lower Express students to agree that *they were good in most of their school subjects* ($p<0.05$), and *they were able to follow their lessons easily* ($p<0.05$).

Subgroup comparisons of changes in students' academic self-concept over time

As noted earlier, the general trend of the Higher Normal students' academic self-concept was less consistent with that of the overall sample than other subgroups of students. In an attempt to establish whether the differences in the changes over time were significantly different between the Lower Express and Higher Normal students, the scores of the students'' academic self-concept measures were subjected to the two-way ANOVA of single factor repeated measures. The analysis revealed significant stream by time interaction effects on the scores of the academic self-concept scale ($p<0.005$), students' confidence subscale ($p<0.05$), and students' effort subscale ($p<0.005$). In view of the significant interaction effects, the changes in the scores of the measures over time were computed independently for the two subgroups of students and subjected to the t-test (see Table 4.1.12 on the following page).

The results, as shown in Table 4.1.12, revealed that there were significant differences between the Lower Express and Higher Normal students in the changes in their academic self-concept over time. In essence, the declines of the scores of the Higher Normal students' academic self-concept measures were significantly less than that of the Lower Express students in a number of cases.

Table 4.1.12: T-test on the changes in Lower Express and Higher Normal students' academic self-concept scores over time

Variable	Time	Stream	Mean	Paired Diff	Level of Sign.
Academic Self-Concept	$Time_0$ - $Time_1$	Lower Express	3.154 - 3.009	0.145	-
		Higher Normal	3.049 - 2.999	0.050	
	$Time_1$ - $Time_2$	Lower Express	3.009 - 2.870	0.139	-
		Higher Normal	2.999 - 2.866	0.133	
	$Time_2$ - $Time_3$	Lower Express	2.870 - 2.768	0.102	$p<0.05$
		Higher Normal	2.866 - 2.892	-0.026	
	$Time_0$ - $Time_3$	Lower Express	3.154 - 2.768	0.386	$p<0.005$
		Higher Normal	3.049 - 2.892	0.157	
(a) Students' Confidence	$Time_0$ - $Time_1$	Lower Express	2.824 - 2.738	0.086	-
		Higher Normal	2.761 - 2.686	0.075	
	$Time_1$ - $Time_2$	Lower Express	2.738 - 2.653	0.085	-
		Higher Normal	2.686 - 2.648	0.038	
	$Time_2$ - $Time_3$	Lower Express	2.653 - 2.557	0.096	$p<0.05$
		Higher Normal	2.648 - 2.700	-0.052	
	$Time_0$ - $Time_3$	Lower Express	2.824 - 2.557	0.267	$p<0.01$
		Higher Normal	2.761 - 2.700	0.061	
(b) Students' Effort	$Time_0$ - $Time_1$	Lower Express	3.484 - 3.280	0.204	$p<0.005$
		Higher Normal	3.336 - 3.311	0.025	
	$Time_1$ - $Time_2$	Lower Express	3.280 - 3.087	0.193	-
		Higher Normal	3.311 - 3.083	0.228	
	$Time_2$ - $Time_3$	Lower Express	3.087 - 2.980	0.107	-
		Higher Normal	3.083 - 3.083	0.000	
	$Time_0$ - $Time_3$	Lower Express	3.484 - 2.980	0.504	$p<0.005$
		Higher Normal	3.336 - 3.083	0.253	

4.1.5 Summary of Key Findings

- The scores of the academic self-concept measures of the students predominantly declined over time. However, most of the declines of the Higher Normal students for the 1-year intervals were not significant.

- There were significant gender effects on the scores of the students' academic self-concept measures. Essentially, the female students had higher scores for the students' effort measures at $time_0$, $time_1$, $time_2$ and $time_3$, and lower score for the students' confidence measure at $time_2$ than the male students.

- There were significant stream effects on the scores of the students' academic self-concept measures. Essentially, the Express students had higher scores for the academic self-concept scale (mainly female students) and students' effort subscale at $time_0$, and lower scores for the academic self-concept scale and students' confidence subscale at $time_3$ than the Normal students. Likewise, the Lower Express students had higher scores for the academic self-concept scale and students' effort subscale at $time_0$, and lower score for the students' confidence subscale at $time_3$ than the Higher Normal students.

- There were significant differences between Express and Normal students, and Lower Express and Higher Normal students in the changes in the scores of their academic self-concept measures over time. Many of the declines of the Normal and Higher Normal students were less than that of their Express and Lower Express counterparts respectively.

4.2 Comparison of Students' Perception of Home Environment

The data analysis in this section was similar to that of Section 4.1. The only difference was that it focused on students' perception of home environment instead of students' academic self-concept. Specifically, it was tailored to answer three broad categories of research questions relating to students' perception of home environment, namely, developmental changes over time, subgroup comparisons at each point in time, and subgroup comparisons of changes over time (see Section 2.8).

4.2.1 Overall Sample

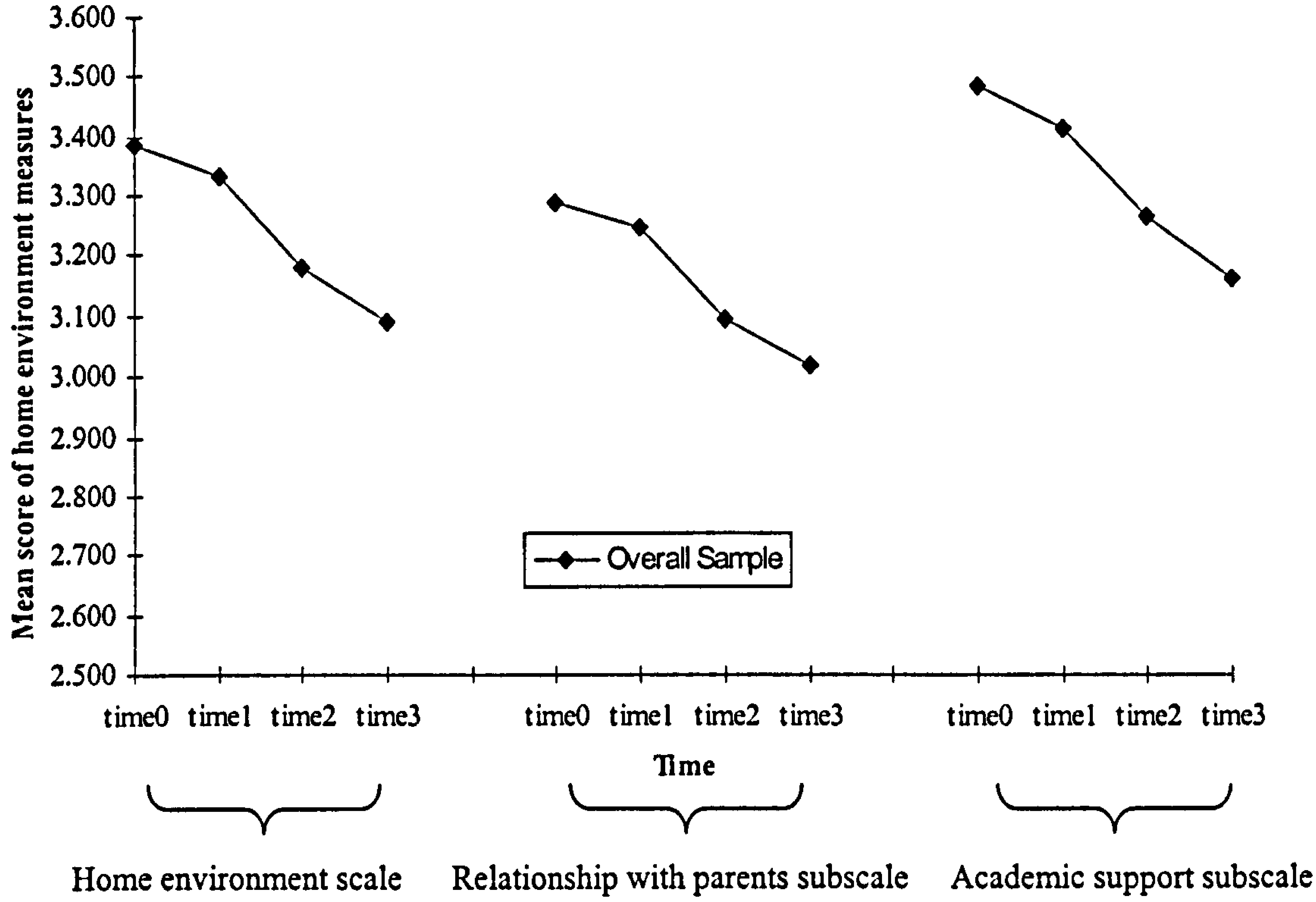
Developmental changes in students' perceived home environment

To establish the developmental changes in students' perception of home environment, the scores of the overall samples' home environment measures at $time_0$, $time_1$, $time_2$ and $time_3$ were computed and subjected to the ANOVA of single factor repeated measures. The analysis revealed significant time effects at 0.001 levels on the scores of repeated measures of the home environment factors, namely, the home environment scale, relationship with parents subscale and academic support subscale. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test for related sample. The results obtained are tabulated in Table 4.2.1 and illustrated in Figure 4.2.1.

Table 4.2.1: Paired t-test on students' home environment scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Home Environment	$Time_0$ $Time_1$	3.385 3.330	0.055	0.332	$p<0.001$
	$Time_1$ $Time_2$	3.330 3.180	0.150	0.354	$p<0.001$
	$Time_2$ $Time_3$	3.180 3.091	0.089	0.360	$p<0.001$
	$Time_0$ $Time_3$	3.385 3.091	0.294	0.407	$p<0.001$
(a) Relationship with Parents	$Time_0$ $Time_1$	3.286 3.245	0.041	0.406	-
	$Time_1$ $Time_2$	3.245 3.094	0.151	0.450	$p<0.001$
	$Time_2$ $Time_3$	3.094 3.019	0.075	0.433	$p<0.001$
	$Time_0$ $Time_3$	3.286 3.019	0.267	0.498	$p<0.001$
(b) Academic Support	$Time_0$ $Time_1$	3.483 3.414	0.069	0.347	$p<0.001$
	$Time_1$ $Time_2$	3.414 3.265	0.149	0.339	$p<0.001$
	$Time_2$ $Time_3$	3.265 3.163	0.102	0.372	$p<0.001$
	$Time_0$ $Time_3$	3.483 3.163	0.320	0.415	$p<0.001$

Figure 4.2.1: Students' home environment scores over time



The results in Table 4.2.1 revealed that the scores of the students' home environment measures were reasonably high. However, they declined significantly for the overall 3-year period and for all except one of the 1-year intervals.

4.2.2 Male and Female Students

Developmental changes in male students' perceived home environment

The scores of the male students' home environment measures were likewise computed and subjected to the ANOVA of single factor repeated measures. The analysis again established significant time effects at 0.001 levels on the scores of repeated measures of the home environment scale and subscales. On the basis of the time effects, the scores of the measures were further subjected to the paired t-test (see Table 4.2.2).

Table 4.2.2: Paired t-test on male students' home environment scores

Variable	Time	Mean	Paired Different Mean	Paired Different SD	Level of Sign.
Home Environment	$Time_0$ $Time_1$	3.345 3.327	0.018	0.336	-
	$Time_1$ $Time_2$	3.327 3.177	0.150	0.378	$p<0.001$
	$Time_2$ $Time_3$	3.177 3.095	0.082	0.404	$p<0.005$
	$Time_0$ $Time_3$	3.345 3.095	0.250	0.425	$p<0.001$
(a) Relationship with Parents	$Time_0$ $Time_1$	3.231 3.230	0.001	0.407	-
	$Time_1$ $Time_2$	3.230 3.086	0.144	0.477	$p<0.001$
	$Time_2$ $Time_3$	3.086 3.018	0.068	0.473	-
	$Time_0$ $Time_3$	3.231 3.018	0.213	0.496	$p<0.001$
(b) Academic Support	$Time_0$ $Time_1$	3.460 3.425	0.034	0.352	-
	$Time_1$ $Time_2$	3.425 3.268	0.157	0.354	$p<0.001$
	$Time_2$ $Time_3$	3.268 3.171	0.097	0.424	$p<0.001$
	$Time_0$ $Time_3$	3.460 3.171	0.289	0.453	$p<0.001$

From Table 4.2.2, it is clear that the general trend of the male students was similar to that of the overall sample in that the scores of the home environment measures were reasonably high, and they declined over time. However, it is noteworthy that the declines from $time_0$ to $time_1$ were all not significant.

Developmental changes in female students' perceived home environment

The aforementioned procedures of the male students were repeated for the female students. The ANOVA of single factor repeated measures likewise established significant time effects at 0.001 levels on the scores of repeated measures of the home environment scale and subscales. As such, the scores of the measures were further subjected to the paired t-test. The results are tabulated in Table 4.2.3.

Table 4.2.3: Paired t-test on female students' home environment scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Home Environment	$Time_0$ $Time_1$	3.427 3.332	0.095	0.324	p<0.001
	$Time_1$ $Time_2$	3.332 3.184	0.148	0.328	p<0.001
	$Time_2$ $Time_3$	3.184 3.087	0.097	0.306	p<0.001
	$Time_0$ $Time_3$	3.427 3.087	0.340	0.383	p<0.001
(a) Relationship with Parents	$Time_0$ $Time_1$	3.345 3.262	0.083	0.401	p<0.005
	$Time_1$ $Time_2$	3.262 3.104	0.158	0.420	p<0.001
	$Time_2$ $Time_3$	3.104 3.021	0.083	0.388	p<0.005
	$Time_0$ $Time_3$	3.345 3.021	0.324	0.495	p<0.001
(b) Academic Support	$Time_0$ $Time_1$	3.509 3.401	0.108	0.337	p<0.001
	$Time_1$ $Time_2$	3.401 3.263	0.138	0.322	p<0.001
	$Time_2$ $Time_3$	3.263 3.154	0.109	0.309	p<0.001
	$Time_0$ $Time_3$	3.509 3.154	0.355	0.367	p<0.001

The result in Table 4.2.3 revealed that the general trend of the female students was consistent with that of the overall sample. In this case, the scores of the measures were reasonably high, and they all decreased significantly over time.

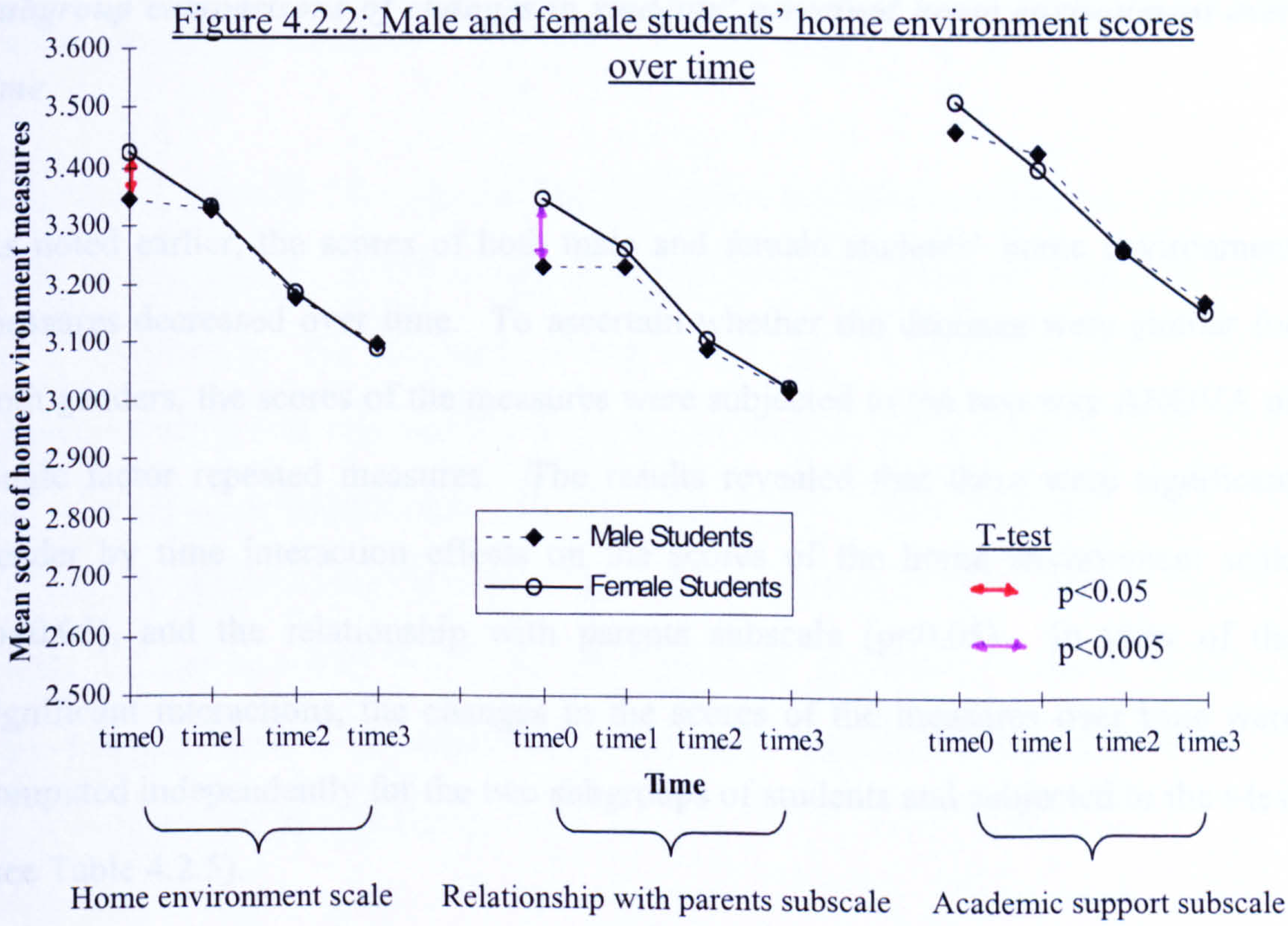
Subgroup comparisons of students' perceived home environment

In order to ascertain whether there was any significant difference between genders in their perceived home environment, the scores of the male and female students' home environment measures were subjected to the t-test for independent samples at different points in time, namely, $time_0$, $time_1$, $time_2$ and $time_3$. The results are tabulated in Table 4.2.4 and illustrated in Figure 4.2.2.

Table 4.2.4: T-test on male and female students' home environment scores

Variable	Time	Gender	Mean	SD	Level of Sign.
Home Environment	Time_0	Male	3.345	0.372	$p<0.05$
	Time_0	Female	3.427	0.354	
	Time_1	Male	3.327	0.399	-
	Time_1	Female	3.332	0.433	
	Time_2	Male	3.177	0.451	-
	Time_2	Female	3.184	0.425	
	Time_3	Male	3.095	0.457	-
	Time_3	Female	3.087	0.436	
(a) Relationship with Parents	Time_0	Male	3.231	0.459	$p<0.005$
	Time_0	Female	3.345	0.430	
	Time_1	Male	3.230	0.487	-
	Time_1	Female	3.262	0.522	
	Time_2	Male	3.086	0.523	-
	Time_2	Female	3.104	0.535	
	Time_3	Male	3.018	0.531	-
	Time_3	Female	3.021	0.529	
(b) Academic Support	Time_0	Male	3.460	0.353	-
	Time_0	Female	3.509	0.342	
	Time_1	Male	3.425	0.370	-
	Time_1	Female	3.401	0.399	
	Time_2	Male	3.268	0.440	-
	Time_2	Female	3.263	0.372	
	Time_3	Male	3.171	0.445	-
	Time_3	Female	3.154	0.407	

Figure 4.2.2: Male and female students' home environment scores over time



The results from Table 4.2.4 revealed that both genders had largely comparable scores for the home environment measures. The only exceptions were found at time$_0$, where the female students had significantly higher scores for the home environment scale and relationship with parents subscale than the male students.

On the basis of the significant gender effects, the students' responses to the home environment scale and relationship with parents subscale at time$_0$ were isolated and subjected to the t-test (Appendix 22).

The t-test revealed that the female students were more inclined than the male students to agree that their *parents liked to spend time with them* ($p<0.005$). In addition, they were more likely to disagree that their *parents always scolded them* ($p<0.01$), their *parents disliked them because they were not good enough* ($p<0.01$), and their *parents did not trust them* ($p<0.001$). They were also more disposed to disagree that their *parents thought they were failures in school* ($p<0.001$), and *they wanted to run away from home* ($p<0.005$).

Subgroup comparisons of changes in students' perceived home environment over time

As noted earlier, the scores of both male and female students' home environment measures decreased over time. To ascertain whether the declines were similar for both genders, the scores of the measures were subjected to the two-way ANOVA of single factor repeated measures. The results revealed that there were significant gender by time interaction effects on the scores of the home environment scale ($p<0.05$), and the relationship with parents subscale ($p<0.05$). In view of the significant interactions, the changes in the scores of the measures over time were computed independently for the two subgroups of students and subjected to the t-test (see Table 4.2.5).

Table 4.2.5: T-test on the changes in male and female students' home environment scores over time

Variable	Time	Gender	Mean	Paired Diff	Level of Sign.
Home Environment	$Time_0$ - $Time_1$	Male	3.345 - 3.327	0.018	p<0.01
		Female	3.427 - 3.332	0.095	
	$Time_1$ - $Time_2$	Male	3.327 - 3.177	0.150	-
		Female	3.332 - 3.184	0.148	
	$Time_2$ - $Time_3$	Male	3.177 - 3.095	0.082	-
		Female	3.184 - 3.087	0.097	
	$Time_0$ - $Time_3$	Male	3.345 - 3.095	0.250	p<0.05
		Female	3.427 - 3.087	0.340	
(a) Relationship with Parents	$Time_0$ - $Time_1$	Male	3.231 - 3.230	0.001	p<0.05
		Female	3.345 - 3.262	0.083	
	$Time_1$ - $Time_2$	Male	3.230 - 3.086	0.144	-
		Female	3.262 - 3.104	0.158	
	$Time_2$ - $Time_3$	Male	3.086 - 3.018	0.068	-
		Female	3.104 - 3.021	0.083	
	$Time_0$ - $Time_3$	Male	3.231 -3.018	0.213	p<0.05
		Female	3.345 - 3.021	0.324	
(b) Academic Support *	$Time_0$ - $Time_1$	Male	3.460 - 3.425	0.034	p<0.05
		Female	3.509 - 3.401	0.108	
	$Time_1$ - $Time_2$	Male	3.425 - 3.268	0.157	-
		Female	3.401 - 3.263	0.138	
	$Time_2$ - $Time_3$	Male	3.268 - 3.171	0.097	-
		Female	3.263 - 3.154	0.109	
	$Time_0$ - $Time_3$	Male	3.460 - 3.171	0.289	-
		Female	3.509 - 3.154	0.355	

Note:
* Two-way ANOVA not significant

The results in Table 4.2.5 revealed that there were significant differences between genders in the changes in the scores of several home environment measures over time. Specifically, the declines of the scores of the male students' home environment scale and relationship with parents subscale from $time_0$ to $time_1$, and $time_0$ to $time_3$ were significantly less than that of the female students. Since no significant interaction effect was established on the scores of the academic support subscale by the two-way ANOVA, the significant difference between genders, detected by the t-test, in the scores of the academic support subscale from $time_0$ to $time_1$ was dismissed as type I error.

4.2.3 Express and Normal Students

Developmental changes in Express students perceived home environment

The scores of the Express students' home environment measures were computed and subjected to the ANOVA of single factor repeated measures. The analysis established significant time effects at 0.001 levels on the scores of repeated measures of the home environment scale and subscales. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test. The results are given in Table 4.2.6.

Table 4.2.6: Paired t-test on Express students' home environment scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Home Environment	$Time_0$ $Time_1$	3.409 3.335	0.074	0.325	$p<0.001$
	$Time_1$ $Time_2$	3.335 3.174	0.161	0.336	$p<0.001$
	$Time_2$ $Time_3$	3.174 3.076	0.098	0.321	$p<0.001$
	$Time_0$ $Time_3$	3.409 3.076	0.333	0.391	$p<0.001$
(a) Relationship with Parents	$Time_0$ $Time_1$	3.315 3.257	0.058	0.397	-
	$Time_1$ $Time_2$	3.257 3.097	0.160	0.445	$p<0.001$
	$Time_2$ $Time_3$	3.097 3.019	0.078	0.405	$p<0.005$
	$Time_0$ $Time_3$	3.315 3.019	0.296	0.493	$p<0.001$
(b) Academic Support	$Time_0$ $Time_1$	3.503 3.413	0.090	0.331	$p<0.001$
	$Time_1$ $Time_2$	3.413 3.252	0.161	0.311	$p<0.001$
	$Time_2$ $Time_3$	3.252 3.132	0.120	0.328	$p<0.001$
	$Time_0$ $Time_3$	3.503 3.132	0.371	0.380	$p<0.001$

The results in Table 4.2.6 revealed that the general trend of the Express students was identical to that of the overall sample. Essentially, the scores of the home environment measures were reasonably high, and they decreased significantly for all except one of the 1-year intervals over the 3-year period.

Developmental changes in Normal students' perceived home environment

The aforementioned procedures of the Express students were repeated for the Normal students. In this case, the ANOVA of single factor repeated measures again established significant time effects at 0.001 levels on the scores of repeated measures of the home environment scale and subscales. As such, the scores of the measures were further subjected to the paired t-test. The results are tabulated in Table 4.2.7.

Table 4.2.7: Paired t-test on Normal students' home environment scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Home Environment	$Time_0$ $Time_1$	3.352 3.322	0.030	0.342	-
	$Time_1$ $Time_2$	3.322 3.188	0.134	0.378	$p<0.001$
	$Time_2$ $Time_3$	3.188 3.112	0.076	0.406	$p<0.01$
	$Time_0$ $Time_3$	3.352 3.112	0.240	0.423	$p<0.001$
(a) Relationship with Parents	$Time_0$ $Time_1$	3.247 3.229	0.018	0.417	-
	$Time_1$ $Time_2$	3.229 3.092	0.137	0.458	$p<0.001$
	$Time_2$ $Time_3$	3.092 3.020	0.072	0.470	-
	$Time_0$ $Time_3$	3.247 3.020	0.227	0.503	$p<0.001$
(b) Academic Support	$Time_0$ $Time_1$	3.457 3.414	0.043	0.365	-
	$Time_1$ $Time_2$	3.414 3.284	0.130	0.372	$p<0.001$
	$Time_2$ $Time_3$	3.284 3.204	0.080	0.425	$p<0.01$
	$Time_0$ $Time_3$	3.457 3.204	0.253	0.449	$p<0.001$

The results, as shown in Table 4.2.7, revealed that the general pattern of the Normal students was similar to that of the overall sample and the Express students. That is, the means of the home environment measures were relatively high, and they decreased over time. In this case, they declined significantly for all except four of the 1-year intervals, including all three from $time_0$ to $time_1$.

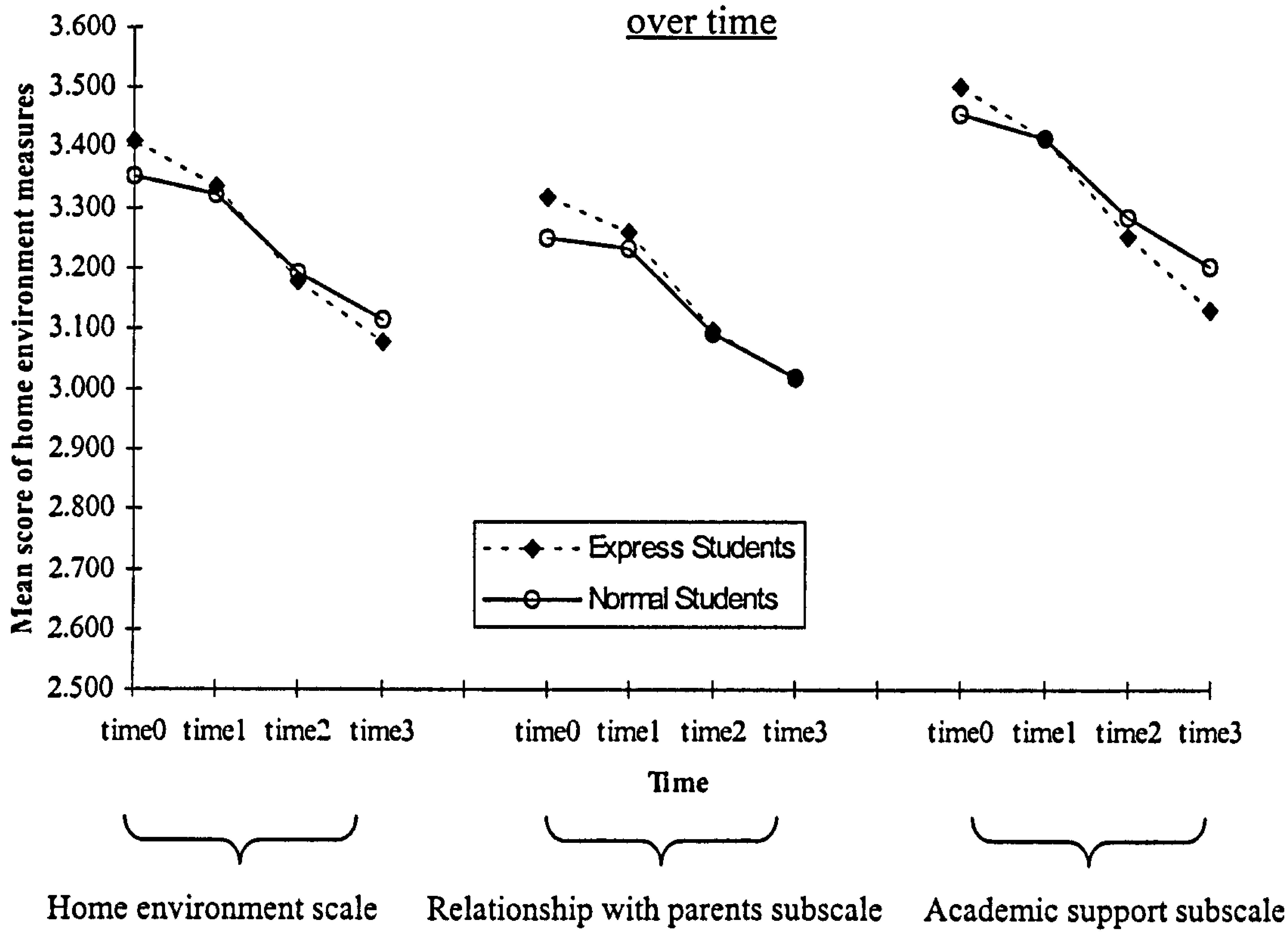
Subgroup comparisons of students' perceived home environment

To determine whether there was any significant difference between streams in students' perceived home environment, the scores of the Express and Normal students' home environment measures were subjected to the t-test at different points in time, namely, $time_0$, $time_1$, $time_2$ and $time_3$. The results are tabulated in Table 4.2.8 and illustrated in Figure 4.2.3.

Table 4.2.8: T-test on Express and Normal students' home environment scores

Variable	Time	Stream	Mean	SD	Level of Sign.
Home Environment	$Time_0$	Express	3.409	0.337	-
	$Time_0$	Normal	3.352	0.399	
	$Time_1$	Express	3.335	0.407	-
	$Time_1$	Normal	3.322	0.427	
	$Time_2$	Express	3.174	0.421	-
	$Time_2$	Normal	3.188	0.462	
	$Time_3$	Express	3.076	0.431	-
	$Time_3$	Normal	3.112	0.468	
(a) Relationship with Parents	$Time_0$	Express	3.315	0.428	-
	$Time_0$	Normal	3.247	0.472	
	$Time_1$	Express	3.257	0.516	-
	$Time_1$	Normal	3.229	0.488	
	$Time_2$	Express	3.097	0.524	-
	$Time_2$	Normal	3.092	0.536	
	$Time_3$	Express	3.019	0.522	-
	$Time_3$	Normal	3.020	0.540	
(b) Academic Support	$Time_0$	Express	3.503	0.312	-
	$Time_0$	Normal	3.457	0.390	
	$Time_1$	Express	3.413	0.360	-
	$Time_1$	Normal	3.414	0.415	
	$Time_2$	Express	3.252	0.380	-
	$Time_2$	Normal	3.284	0.444	
	$Time_3$	Express	3.132	0.406	-
	$Time_3$	Normal	3.204	0.450	

Figure 4.2.3: Express and Normal students' home environment scores over time



The results in Table 4.2.8 revealed that there was no significant difference between the Express and Normal students in the scores of their home environment measures.

Subgroup comparisons of changes in students' perceived home environment over time

As noted earlier, the scores of the home environment measures of the Express and Normal students declined over time. To ascertain whether the declines were similar for the two groups of students, the scores of the home environment measures were subjected to the two-way ANOVA of single factor repeated measures. The result revealed significant stream by time interaction effects on the scores of the home environment scale ($p<0.05$), and the academic support subscale ($p<0.01$). Based on the significant interaction effects, the changes in the scores of the measures over time were computed independently for the two groups of students and subjected to the t-test. The results are given in Table 4.2.9.

Table 4.2.9: T-test on the changes in Express and Normal students' home environment scores over time

Variable	Time	Stream	Mean	Paired Diff	Level of Sign.
Home Environment	$Time_0$ - $Time_1$	Express	3.409 - 3.335	0.074	-
		Normal	3.352 - 3.322	0.030	
	$Time_1$ - $Time_2$	Express	3.335 - 3.174	0.161	-
		Normal	3.322 - 3.188	0.134	
	$Time_2$ - $Time_3$	Express	3.174 - 3.076	0.098	-
		Normal	3.188 - 3.112	0.076	
	$Time_0$ - $Time_3$	Express	3.409 - 3.076	0.333	$p<0.05$
		Normal	3.352 - 3.112	0.240	
(a) Relationship with Parents *	$Time_0$ - $Time_1$	Express	3.315 - 3.257	0.058	-
		Normal	3.247 - 3.229	0.018	
	$Time_1$ - $Time_2$	Express	3.257 - 3.097	0.160	-
		Normal	3.229 - 3.092	0.137	
	$Time_2$ - $Time_3$	Express	3.097 - 3.019	0.078	-
		Normal	3.092 - 3.020	0.072	
	$Time_0$ - $Time_3$	Express	3.315 - 3.019	0.296	-
		Normal	3.247 - 3.020	0.227	
(b) Academic Support	$Time_0$ - $Time_1$	Express	3.503 - 3.413	0.090	-
		Normal	3.457 - 3.414	0.043	
	$Time_1$ - $Time_2$	Express	3.413 - 3.252	0.161	-
		Normal	3.414 - 3.284	0.130	
	$Time_2$ - $Time_3$	Express	3.252 - 3.132	0.120	-
		Normal	3.284 - 3.204	0.080	
	$Time_0$ - $Time_3$	Express	3.503 - 3.132	0.371	$p<0.005$
		Normal	3.457 - 3.204	0.253	

Note:
* Two-way ANOVA not significant

Table 4.2.9 revealed that the declines of the scores of the Normal students' home environment scale and academic support subscale for the overall 3-year period were significantly less than that of their Express counterparts.

4.2.4 Lower Express and Higher Normal Students

Developmental changes in Lower Express students' perceived home environment

The scores of the Lower Express students' home environment measures were computed and subjected to the ANOVA of single factor repeated measures. The analysis established significant time effects at 0.001 levels on the scores of repeated measures of the home environment scale and subscales. On the basis of the significant time effects, the scores of the measures were further subjected to the paired t-test. The results are given in Table 4.2.10.

Table 4.2.10: Paired t-test on Lower Express students' home environment scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Home Environment	$Time_0$ $Time_1$	3.438 3.371	0.067	0.349	-
	$Time_1$ $Time_2$	3.371 3.138	0.233	0.308	p<0.001
	$Time_2$ $Time_3$	3.138 3.085	0.053	0.362	-
	$Time_0$ $Time_3$	3.438 3.085	0.353	0.411	p<0.001
(a) Relationship with Parents	$Time_0$ $Time_1$	3.354 3.332	0.022	0.417	-
	$Time_1$ $Time_2$	3.332 3.059	0.273	0.430	p<0.001
	$Time_2$ $Time_3$	3.059 3.007	0.052	0.471	-
	$Time_0$ $Time_3$	3.354 3.007	0.347	0.512	p<0.001
(b) Academic Support	$Time_0$ $Time_1$	3.522 3.410	0.112	0.345	p<0.005
	$Time_1$ $Time_2$	3.410 3.218	0.192	0.261	p<0.001
	$Time_2$ $Time_3$	3.218 3.163	0.055	0.341	-
	$Time_0$ $Time_3$	3.522 3.163	0.359	0.384	p<0.001

Table 4.2.10 revealed that the general pattern of the Lower Express students was not unlike that of the overall sample in that the scores of the home environment measures were reasonably high and they declined over time. However, for this group of students, many of the declines of the scores from $time_0$ to $time_1$, and $time_2$ to $time_3$ were not significant.

Developmental changes in Higher Normal students' perceived home environment

The aforementioned procedures of the Lower Express students were repeated for the Higher Normal students. The ANOVA of single factor repeated measures likewise established significant time effects at 0.001 levels on the scores of repeated measures of the home environment scale and subscales. Thus, the scores of the measures were further subjected to the paired t-test. The results are tabulated in Table 4.2.11.

Table 4.2.11: Paired t-test on Higher Normal students' home environment scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Home Environment	$Time_0$ $Time_1$	3.323 3.371	-0.048	0.284	-
	$Time_1$ $Time_2$	3.371 3.216	0.155	0.339	$p<0.001$
	$Time_2$ $Time_3$	3.216 3.111	0.105	0.443	-
	$Time_0$ $Time_3$	3.323 3.111	0.212	0.438	$p<0.001$
(a) Relationship with Parents	$Time_0$ $Time_1$	3.208 3.283	-0.075	0.350	-
	$Time_1$ $Time_2$	3.283 3.121	0.162	0.415	$p<0.005$
	$Time_2$ $Time_3$	3.121 3.023	0.098	0.499	-
	$Time_0$ $Time_3$	3.208 3.023	0.185	0.501	$p<0.005$
(b) Academic Support	$Time_0$ $Time_1$	3.439 3.458	-0.019	0.356	-
	$Time_1$ $Time_2$	3.458 3.311	0.147	0.360	$p<0.005$
	$Time_2$ $Time_3$	3.311 3.200	0.111	0.464	-
	$Time_0$ $Time_3$	3.439 3.200	0.239	0.497	$p<0.001$

From Table 4.2.11, it is evident that the general pattern of the Higher Normal students was unlike that of the overall sample and other subgroups of students in that the scores of the home environment scale and subscales actually increased, although not significantly, from $time_0$ to $time_1$. However, similar to that of the Lower Express students, the changes in the scores from $time_0$ to $time_1$, and from $time_2$ to $time_3$ were not significant.

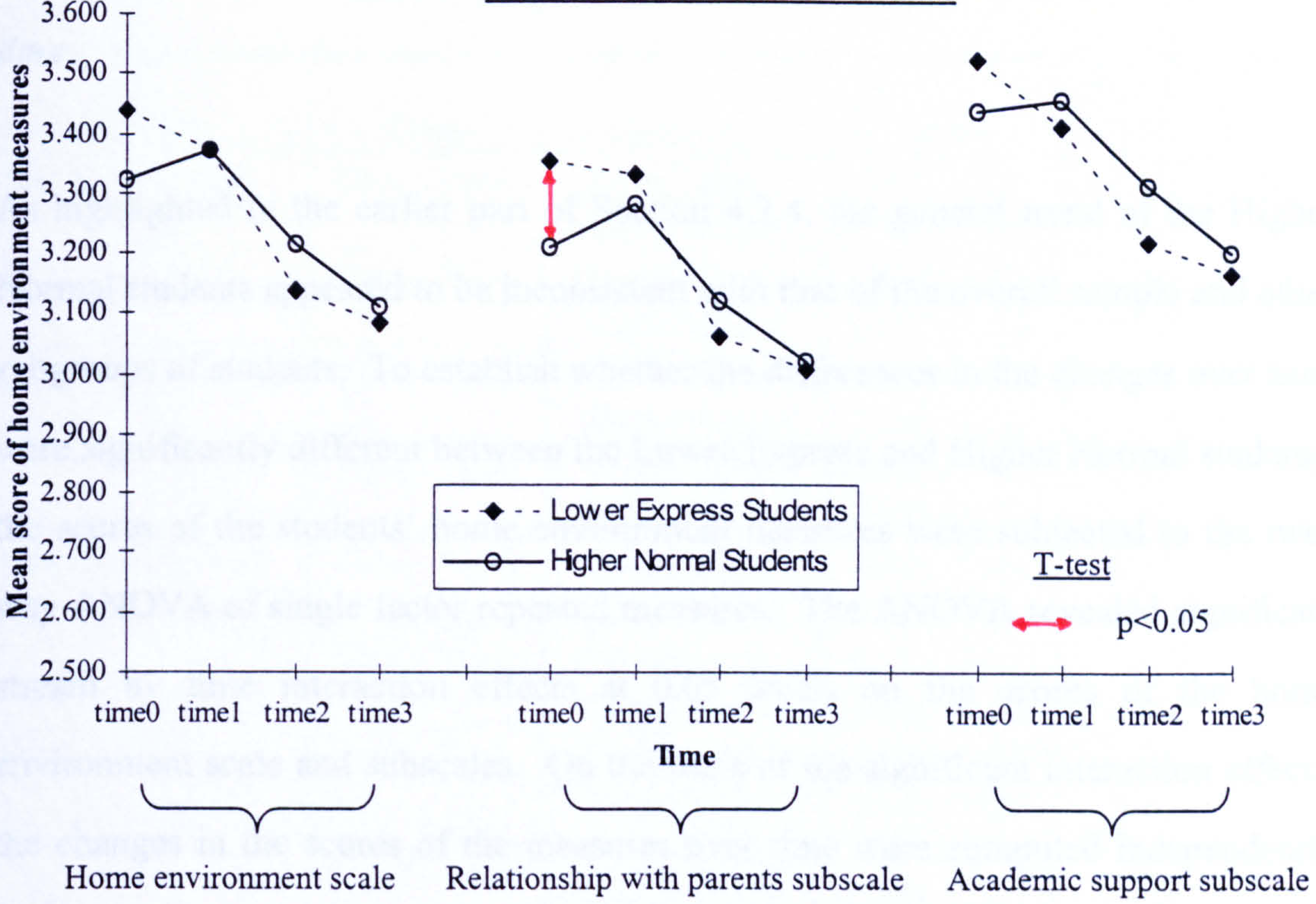
Subgroup comparisons of students' perceived home environment

To determine whether there was any significant difference between the Lower Express and Higher Normal students in their perceived home environment, the scores of the home environment measures of the two subgroups of students were subjected to the t-test at $time_0$, $time_1$, $time_2$ and $time_3$. The results are tabulated in Table 4.2.12 and illustrated in Figure 4.2.4.

Table 4.2.12: T-test on Lower Express and Higher Normal students' home environment scores

Variable	Time	Stream	Mean	SD	Level of Sign.
Home Environment	$Time_0$	Lower Express	3.438	0.352	-
	$Time_0$	Higher Normal	3.323	0.385	
	$Time_1$	Lower Express	3.371	0.407	-
	$Time_1$	Higher Normal	3.371	0.395	
	$Time_2$	Lower Express	3.138	0.447	-
	$Time_2$	Higher Normal	3.216	0.450	
	$Time_3$	Lower Express	3.085	0.433	-
	$Time_3$	Higher Normal	3.111	0.457	
(a) Relationship with Parents	$Time_0$	Lower Express	3.354	0.428	$p<0.05$
	$Time_0$	Higher Normal	3.208	0.482	
	$Time_1$	Lower Express	3.332	0.488	-
	$Time_1$	Higher Normal	3.283	0.458	
	$Time_2$	Lower Express	3.059	0.570	-
	$Time_2$	Higher Normal	3.121	0.530	
	$Time_3$	Lower Express	3.007	0.531	-
	$Time_3$	Higher Normal	3.023	0.497	
(b) Academic Support	$Time_0$	Lower Express	3.522	0.328	-
	$Time_0$	Higher Normal	3.439	0.359	
	$Time_1$	Lower Express	3.410	0.371	-
	$Time_1$	Higher Normal	3.458	0.384	
	$Time_2$	Lower Express	3.218	0.390	-
	$Time_2$	Higher Normal	3.311	0.432	
	$Time_3$	Lower Express	3.163	0.402	-
	$Time_3$	Higher Normal	3.200	0.469	

Figure 4.2.4: Lower Express and Higher Normal students' home environment scores over time



The results in Table 4.2.12 revealed that the Lower Express and Higher Normal students had largely comparable perceptions of home environment. However, the Higher Normal students had significantly lower scores for the relationship with parents subscale at $time_0$ than the Lower Express students.

In view of the significant stream effect, the Lower Express and Higher Normal students' responses to the relationship with parents subscale at $time_0$ were isolated and subjected to the t-test (Appendix 23).

The t-test revealed the Higher Normal students were more inclined than the Lower Express students to agree that they wanted to *run away from home* ($p<0.05$).

Subgroup comparisons of changes in students' perceived home environment over time

As highlighted in the earlier part of Section 4.2.4, the general trend of the Higher Normal students appeared to be inconsistent with that of the overall sample and other subgroups of students. To establish whether the differences in the changes over time were significantly different between the Lower Express and Higher Normal students, the scores of the students' home environment measures were subjected to the two-way ANOVA of single factor repeated measures. The ANOVA revealed significant stream by time interaction effects at 0.05 levels on the scores of the home environment scale and subscales. On the basis of the significant interaction effects, the changes in the scores of the measures over time were computed independently for both subgroups of students and subjected to the t-test. The results are given in Table 4.2.13 on the following page.

The results, as shown in Table 4.2.13, established significant differences between the Lower Express and Higher Normal students in the changes in the scores of their home environment measures over time. Specifically, the changes in the scores of the Higher Normal students' academic support subscale from $time_0$ to $time_1$, and home environment scale from $time_0$ to $time_1$ and from $time_0$ to $time_3$ were significantly less than that of the Lower Express students.

Table 4.2.13: T-test on the changes in Lower Express and Higher Normal students' home environment scores over time

Variable	Time	Stream	Mean	Paired Diff	Level of Sign.
Home Environment	$Time_0$ - $Time_1$	Lower Express	3.438 - 3.371	0.067	p<0.05
		Higher Normal	3.323 - 3.371	-0.048	
	$Time_1$ - $Time_2$	Lower Express	3.371 - 3.138	0.233	-
		Higher Normal	3.371 - 3.216	0.155	
	$Time_2$ - $Time_3$	Lower Express	3.138 - 3.085	0.053	-
		Higher Normal	3.216 - 3.111	0.105	
	$Time_0$ - $Time_3$	Lower Express	3.438 - 3.085	0.353	p<0.05
		Higher Normal	3.323 - 3.111	0.212	
(a) Relationship with Parents	$Time_0$ - $Time_1$	Lower Express	3.354 - 3.332	0.022	-
		Higher Normal	3.208 - 3.283	-0.075	
	$Time_1$ - $Time_2$	Lower Express	3.332 - 3.059	0.273	-
		Higher Normal	3.283 - 3.121	0.162	
	$Time_2$ - $Time_3$	Lower Express	3.059 - 3.007	0.052	-
		Higher Normal	3.121 - 3.023	0.098	
	$Time_0$ - $Time_3$	Lower Express	3.354 - 3.007	0.347	-
		Higher Normal	3.208 - 3.023	0.185	
(b) Academic Support	$Time_0$ - $Time_1$	Lower Express	3.522 - 3.410	0.112	p<0.05
		Higher Normal	3.439 - 3.458	-0.019	
	$Time_1$ - $Time_2$	Lower Express	3.410 - 3.218	0.192	-
		Higher Normal	3.458 - 3.311	0.147	
	$Time_2$ - $Time_3$	Lower Express	3.218 - 3.163	0.055	-
		Higher Normal	3.311 - 3.200	0.111	
	$Time_0$ - $Time_3$	Lower Express	3.522 - 3.163	0.359	-
		Higher Normal	3.439 - 3.200	0.239	

4.2.5 Summary of Key Findings

- Generally, the scores of the home environment measures of the students declined over time. However, the changes in the scores of the home environment measures of the male students, and the Normal students were not significant for the first 1-year interval, whilst that of the Lower Express and Higher Normal students were not significant for the first and last 1-year intervals.

- Both genders had largely comparable scores for the home environment measures. However, the female students had higher scores for the home environment scale, and relationship with parents subscale at $time_0$ than the male students.

- There were significant differences between genders in the changes in the scores of their home environment measures over time. The scores of the female students' home environment scale and relationship with parents subscale declined significantly more than that of the male students for the first 1-year interval and the overall 3-year period.

- There was a significant stream effect on the scores of Lower Express and Higher Normal students' home environment measures at $time_0$. Specifically, the Higher Normal students had lower score for the relationship with parents subscale than the Lower Express students.

- There were significant differences between Express and Normal students, and Lower Express and Higher Normal students in the changes in the scores of their home environment measures over time. Specifically, the scores of the Express students' home environment scale and academic support subscale declined significantly more than that of the Normal students for the overall 3-year period. Likewise, the scores of the Lower Express students' home environment scale declined significantly more than that of their Higher Normal counterparts for the first 1-year interval and the overall 3-year period, whilst that of the academic support subscale declined significantly more for the first 1-year interval.

4.3 Comparison of Students' Perception of Classroom Climate

The data analysis in this section was similar to that of Sections 4.1 and 4.2. In this case, the focus was on students' perception of classroom climate. Specifically, it was tailored to answer three broad categories of research questions pertaining to students' perception of classroom climate, namely, developmental changes over time, subgroup comparisons at each point in time, and subgroup comparisons of changes over time (see Section 2.8).

4.3.1 Overall Sample

Developmental changes in students' perceived classroom climate

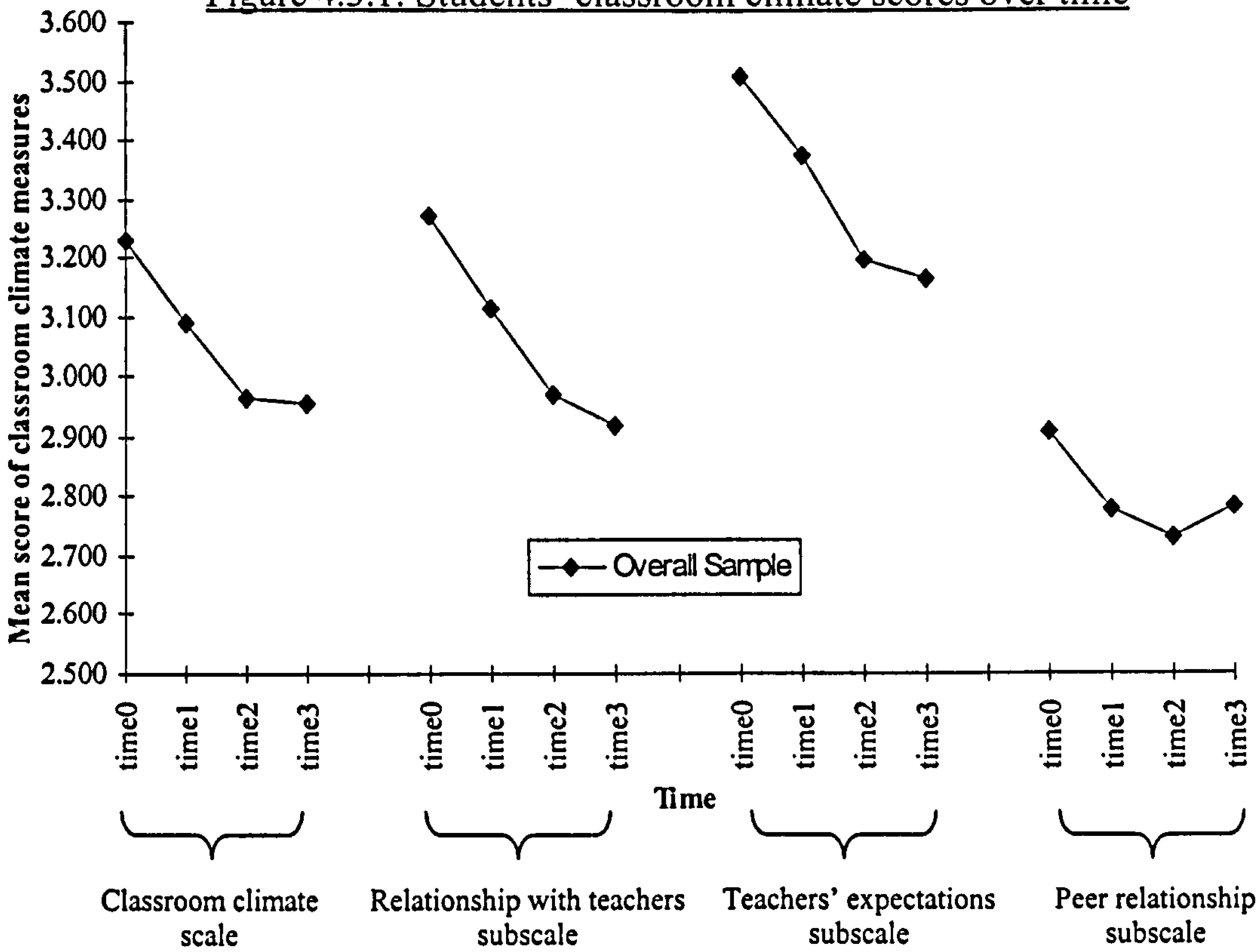
To establish the developmental changes in students' perception of classroom climate, the scores of the overall sample's classroom climate measures at $time_0$, $time_1$, $time_2$ and $time_3$ were computed and subjected to the ANOVA of single factor repeated measures. The ANOVA revealed significant time effects at 0.001 levels on the scores of repeated measures of the classroom climate factors, namely, the classroom climate scale, relationship with teachers subscale, teachers' expectations subscale and peer relationship subscale. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test. The results are given in Table 4.3.1 on page 169, and illustrated in Figure 4.3.1 on page 170.

The results, as shown in Table 4.3.1, established that the scores of the students' classroom climate measures were fairly high. Nevertheless, they declined significantly for the overall 3-year period, and for most of the first and second 1-year intervals of the study. The exception was the peer relationship subscale, which recorded a significant increase in the scores for the last 1-year interval of the study.

Table 4.3.1: Paired t-test on students' classroom climate scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Classroom Climate	$Time_0$ $Time_1$	3.227 3.089	0.138	0.331	$p<0.001$
	$Time_1$ $Time_2$	3.089 2.965	0.124	0.328	$p<0.001$
	$Time_2$ $Time_3$	2.965 2.956	0.009	0.325	-
	$Time_0$ $Time_3$	3.227 2.956	0.271	0.364	$p<0.001$
(a) Relationship with Teachers	$Time_0$ $Time_1$	3.269 3.113	0.156	0.434	$p<0.001$
	$Time_1$ $Time_2$	3.113 2.968	0.145	0.422	$p<0.001$
	$Time_2$ $Time_3$	2.968 2.919	0.049	0.434	-
	$Time_0$ $Time_3$	3.269 2.919	0.350	0.444	$p<0.001$
(b) Teachers' Expectations	$Time_0$ $Time_1$	3.506 3.372	0.134	0.390	$p<0.001$
	$Time_1$ $Time_2$	3.372 3.195	0.177	0.425	$p<0.001$
	$Time_2$ $Time_3$	3.195 3.164	0.031	0.440	-
	$Time_0$ $Time_3$	3.506 3.164	0.342	0.477	$p<0.001$
(c) Peer Relationship	$Time_0$ $Time_1$	2.908 2.780	0.128	0.442	$p<0.001$
	$Time_1$ $Time_2$	2.780 2.732	0.048	0.424	-
	$Time_2$ $Time_3$	2.732 2.784	-0.052	0.419	$p<0.01$
	$Time_0$ $Time_3$	2.908 2.784	0.124	0.475	$p<0.001$

Figure 4.3.1: Students' classroom climate scores over time



4.3.2 Male and Female Students

Developmental changes in male students' perceived classroom climate

The scores of the male students' classroom climate measures were likewise computed and subjected to the ANOVA of single factor repeated measures. The ANOVA established significant time effects at 0.001 levels on the scores of repeated measures of the classroom climate scale and subscales. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test. The results are given in Table 4.3.2 on the following page.

The results in Table 4.3.2 revealed that the general trend of the male students mirrored that of the overall sample in that the scores of the classroom climate measures were reasonably high, and they decreased over time. Similar to that of the overall sample, most of the non-significant declines were documented for the last 1-year interval, namely, from $time_2$ to $time_3$.

Table 4.3.2: Paired t-test on male students' classroom climate scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Classroom Climate	$Time_0$ $Time_1$	3.206 3.088	0.118	0.335	p<0.001
	$Time_1$ $Time_2$	3.088 2.954	0.134	0.357	p<0.001
	$Time_2$ $Time_3$	2.954 2.940	0.014	0.350	-
	$Time_0$ $Time_3$	3.206 2.940	0.266	0.382	p<0.001
(a) Relationship with Teachers	$Time_0$ $Time_1$	3.249 3.133	0.116	0.444	p<0.001
	$Time_1$ $Time_2$	3.133 2.976	0.157	0.459	p<0.001
	$Time_2$ $Time_3$	2.976 2.939	0.037	0.456	-
	$Time_0$ $Time_3$	3.249 2.939	0.310	0.438	p<0.001
(b) Teachers' Expectations	$Time_0$ $Time_1$	3.506 3.371	0.135	0.394	p<0.001
	$Time_1$ $Time_2$	3.371 3.197	0.174	0.455	p<0.001
	$Time_2$ $Time_3$	3.197 3.144	0.053	0.463	-
	$Time_0$ $Time_3$	3.506 3.144	0.362	0.510	p<0.001
(c) Peer Relationship	$Time_0$ $Time_1$	2.864 2.761	0.103	0.436	p<0.001
	$Time_1$ $Time_2$	2.761 2.690	0.071	0.453	-
	$Time_2$ $Time_3$	2.690 2.738	-0.048	0.466	-
	$Time_0$ $Time_3$	2.864 2.738	0.126	0.489	p<0.001

Developmental changes in female students' perceived classroom climate

The aforementioned procedures of the male students were repeated for the female students. The ANOVA of single factor repeated measures likewise established significant time effects at 0.001 levels on the scores of repeated measures of the classroom climate scale and subscales. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test. The results are given in Table 4.3.3.

Table 4.3.3: Paired t-test on female students' classroom climate scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Classroom Climate	$Time_0$ $Time_1$	3.249 3.089	0.160	0.326	p<0.001
	$Time_1$ $Time_2$	3.089 2.977	0.112	0.295	p<0.001
	$Time_2$ $Time_3$	2.977 2.972	0.005	0.297	-
	$Time_0$ $Time_3$	3.249 2.972	0.277	0.344	p<0.001
(a) Relationship with Teachers	$Time_0$ $Time_1$	3.291 3.093	0.198	0.420	p<0.001
	$Time_1$ $Time_2$	3.093 2.960	0.133	0.379	p<0.001
	$Time_2$ $Time_3$	2.960 2.898	0.062	0.409	-
	$Time_0$ $Time_3$	3.291 2.898	0.393	0.449	p<0.001
(b) Teachers' Expectations	$Time_0$ $Time_1$	3.505 3.373	0.132	0.386	p<0.001
	$Time_1$ $Time_2$	3.373 3.193	0.180	0.393	p<0.001
	$Time_2$ $Time_3$	3.193 3.185	0.008	0.415	-
	$Time_0$ $Time_3$	3.505 3.185	0.320	0.439	p<0.001
(c) Peer Relationship	$Time_0$ $Time_1$	2.955 2.801	0.154	0.447	p<0.001
	$Time_1$ $Time_2$	2.801 2.778	0.023	0.391	-
	$Time_2$ $Time_3$	2.778 2.834	-0.056	0.364	-
	$Time_0$ $Time_3$	2.955 2.834	0.121	0.459	p<0.001

The results, as shown in Table 4.3.3, revealed that the general trend of the female students was consistent with that of the overall sample and the male students in that the scores of the classroom climate measures were relatively high, and they decreased over time. In addition, similar to that of the overall sample and the male students, most of the non-significant declines were documented for the last 1-year interval, namely, from $time_2$ to $time_3$.

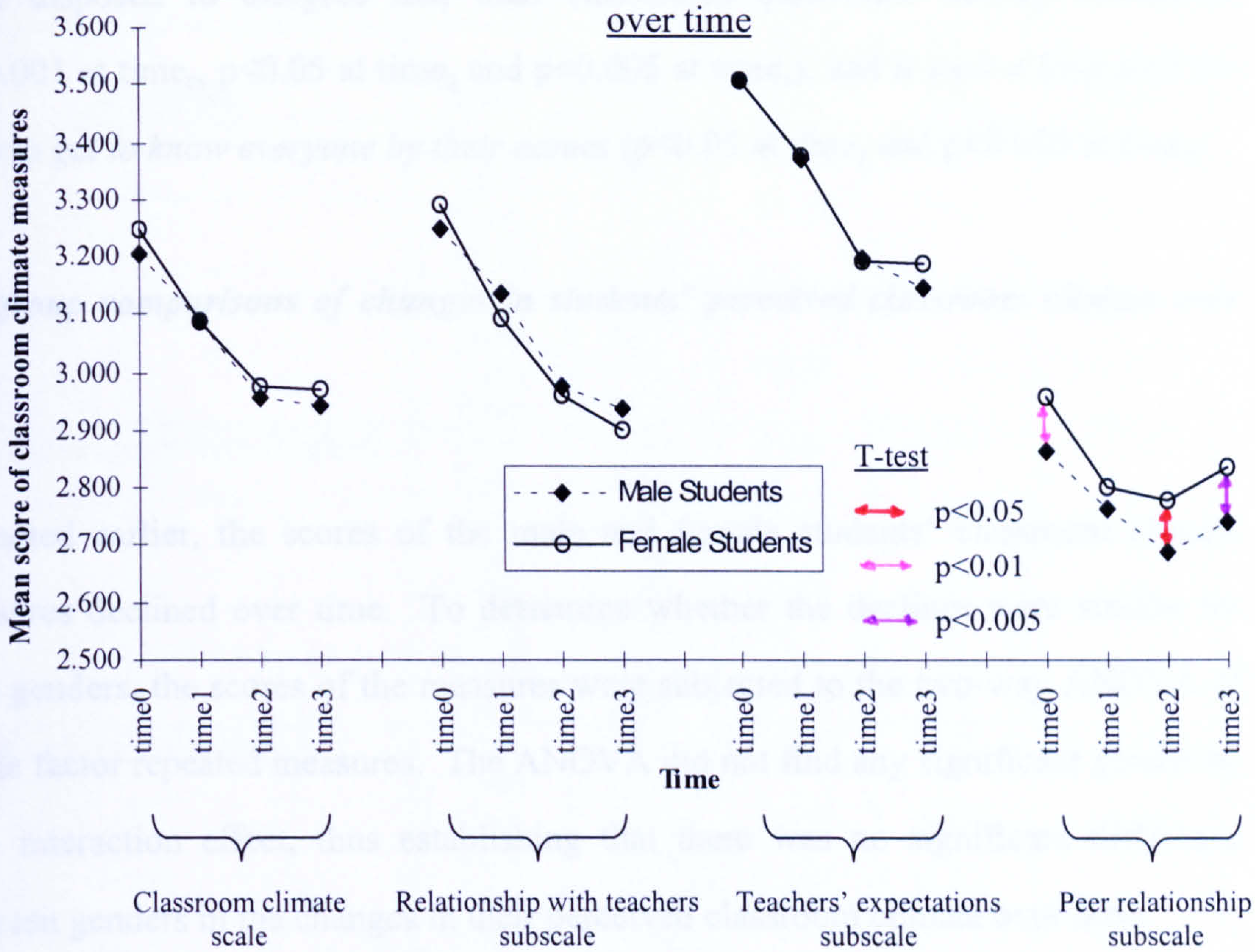
Subgroup comparisons of students' perceived classroom climate

In order to establish whether there was any significant difference between genders in students' perceived classroom climate, the scores of the male and female students' classroom climate measures were subjected to the t-test at $time_0$, $time_1$, $time_2$ and $time_3$. The results are tabulated in Table 4.3.4 and illustrated in Figure 4.3.2.

Table 4.3.4: T-test on male and female students' classroom climate scores

Variable	Time	Gender	Mean	SD	Level of Sign.
Classroom Climate	$Time_0$	Male	3.206	0.292	-
	$Time_0$	Female	3.249	0.302	
	$Time_1$	Male	3.088	0.350	-
	$Time_1$	Female	3.089	0.350	
	$Time_2$	Male	2.954	0.374	-
	$Time_2$	Female	2.977	0.308	
	$Time_3$	Male	2.940	0.338	-
	$Time_3$	Female	2.972	0.309	
(a) Relationship with Teachers	$Time_0$	Male	3.249	0.355	-
	$Time_0$	Female	3.291	0.350	
	$Time_1$	Male	3.133	0.454	-
	$Time_1$	Female	3.093	0.435	
	$Time_2$	Male	2.976	0.457	-
	$Time_2$	Female	2.960	0.381	
	$Time_3$	Male	2.939	0.401	-
	$Time_3$	Female	2.898	0.393	
(b) Teachers' Expectations	$Time_0$	Male	3.506	0.351	-
	$Time_0$	Female	3.505	0.354	
	$Time_1$	Male	3.371	0.375	-
	$Time_1$	Female	3.373	0.393	
	$Time_2$	Male	3.197	0.461	-
	$Time_2$	Female	3.193	0.398	
	$Time_3$	Male	3.144	0.451	-
	$Time_3$	Female	3.185	0.405	
(c) Peer Relationship	$Time_0$	Male	2.864	0.376	$p<0.01$
	$Time_0$	Female	2.955	0.378	
	$Time_1$	Male	2.761	0.435	-
	$Time_1$	Female	2.801	0.420	
	$Time_2$	Male	2.690	0.420	$p<0.05$
	$Time_2$	Female	2.778	0.350	
	$Time_3$	Male	2.738	0.369	$p<0.005$
	$Time_3$	Female	2.834	0.341	

Figure 4.3.2: Male and female students' classroom climate scores over time



The results from Table 4.3.4 revealed that both genders had highly comparable scores for the classroom climate, relationship with teachers and teachers' expectations measures. However, the female students had significantly higher scores for the peer relationship subscales at $time_0$, $time_2$ and $time_3$ than the male students.

On the basis of the significant gender effects, the students' responses to the peer relationship subscales at $time_0$, $time_2$ and $time_3$ were isolated and subjected to the t-test (Appendix 24).

The t-test revealed that among the many differences, the female students were more inclined than their male counterparts to agree that *they showed care and concern for their classmates who had problems* ($p<0.05$ at $time_0$ and $p<0.05$ at $time_2$). They were also more likely to agree that *they helped one another with their homework* ($p<0.005$ at $time_0$ and $p<0.05$ at $time_2$), and *they respected their monitors and co-operated with them* ($p<0.01$ at $time_0$, $p<0.005$ at $time_2$ and $p<0.05$ at $time_3$). In addition, they were more disposed to disagree that their *classmates quarrelled among themselves* ($p<0.001$ at $time_0$, $p<0.05$ at $time_2$ and $p<0.005$ at $time_3$), and *it took a long time for them to get to know everyone by their names* ($p<0.05$ at $time_2$ and $p<0.005$ at $time_3$).

Subgroup comparisons of changes in students' perceived classroom climate over time

As noted earlier, the scores of the male and female students' classroom climate measures declined over time. To determine whether the declines were similar for both genders, the scores of the measures were subjected to the two-way ANOVA of single factor repeated measures. The ANOVA did not find any significant gender by time interaction effect, thus establishing that there was no significant difference between genders in the changes in their perceived classroom climate over time.

4.3.3 Express and Normal Students

Developmental changes in Express students' perceived classroom climate

Similar to that of the overall sample, the scores of the Express students' classroom climate measures were computed and subjected to the ANOVA of single factor repeated measures. The ANOVA established significant time effects at 0.001 levels on the scores of repeated measures of the classroom climate scale and subscales. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test, and the results are given in Table 4.3.5 on the following page.

From Table 4.3.5, it is clear that the results of the Express students were consistent with that of the overall sample in that the scores of the classroom climate measures were high and they decreased over time. In addition, the non-significant changes were also documented for the last 1-year interval, namely, from $time_2$ to $time_3$.

Table 4.3.5: Paired t-test on Express students' classroom climate scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Classroom Climate	$Time_0$ $Time_1$	3.266 3.074	0.192	0.311	$p<0.001$
	$Time_1$ $Time_2$	3.074 2.959	0.115	0.309	$p<0.001$
	$Time_2$ $Time_3$	2.959 2.937	0.022	0.325	-
	$Time_0$ $Time_3$	3.266 2.937	0.329	0.352	$p<0.001$
(a) Relationship with Teachers	$Time_0$ $Time_1$	3.301 3.070	0.231	0.418	$p<0.001$
	$Time_1$ $Time_2$	3.070 2.959	0.111	0.400	$p<0.001$
	$Time_2$ $Time_3$	2.959 2.886	0.073	0.430	$p<0.01$
	$Time_0$ $Time_3$	3.301 2.886	0.415	0.427	$p<0.001$
(b) Teachers' Expectations	$Time_0$ $Time_1$	3.538 3.353	0.185	0.369	$p<0.001$
	$Time_1$ $Time_2$	3.353 3.193	0.160	0.378	$p<0.001$
	$Time_2$ $Time_3$	3.193 3.136	0.057	0.426	-
	$Time_0$ $Time_3$	3.538 3.136	0.402	0.461	$p<0.001$
(c) Peer Relationship	$Time_0$ $Time_1$	2.962 2.798	0.164	0.426	$p<0.001$
	$Time_1$ $Time_2$	2.798 2.726	0.072	0.411	$p<0.005$
	$Time_2$ $Time_3$	2.726 2.789	-0.063	0.416	-
	$Time_0$ $Time_3$	2.962 2.789	0.173	0.471	$p<0.001$

Developmental changes in Normal students' perceived classroom climate

The aforementioned procedures of the Express students were repeated for the Normal students. In this case, the ANOVA of single factor repeated measures established significant time effects on the scores of repeated measures of the classroom climate scale ($p<0.001$), relationship with teachers subscale ($p<0.001$), teachers' expectations subscale ($p<0.001$), and peer relationship subscale ($p<0.05$). As a result of the significant time effects, the scores of the measures were further subjected to the paired t-test. The results are tabulated in Table 4.3.6.

Table 4.3.6: Paired t-test on Normal students' classroom climate scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Classroom Climate	$Time_0$ $Time_1$	3.175 3.108	0.067	0.344	p<0.01
	$Time_1$ $Time_2$	3.108 2.973	0.135	0.353	p<0.001
	$Time_2$ $Time_3$	2.973 2.981	-0.008	0.325	-
	$Time_0$ $Time_3$	3.175 2.981	0.194	0.366	p<0.001
(a) Relationship with Teachers	$Time_0$ $Time_1$	3.226 3.171	0.055	0.436	-
	$Time_1$ $Time_2$	3.171 2.981	0.190	0.448	p<0.001
	$Time_2$ $Time_3$	2.981 2.964	0.017	0.437	-
	$Time_0$ $Time_3$	3.226 2.964	0.262	0.453	p<0.001
(b) Teachers' Expectations	$Time_0$ $Time_1$	3.462 3.398	0.064	0.407	-
	$Time_1$ $Time_2$	3.398 3.198	0.200	0.482	p<0.001
	$Time_2$ $Time_3$	3.198 3.202	-0.004	0.458	-
	$Time_0$ $Time_3$	3.462 3.202	0.260	0.487	p<0.001
(c) Peer Relationship	$Time_0$ $Time_1$	2.836 2.756	0.080	0.458	-
	$Time_1$ $Time_2$	2.756 2.740	0.016	0.441	-
	$Time_2$ $Time_3$	2.740 2.779	-0.039	0.424	-
	$Time_0$ $Time_3$	2.836 2.779	0.057	0.473	-

The results in Table 4.3.6 revealed that the general trend of the Normal students was unlike that of the overall sample and the Express students. Essentially, for the Normal students, most of the declines for the first 1-year interval, and all the changes in the scores of the peer relationship subscale over the 3-year period failed to reach statistical significance. In addition, most of the scores of the measures actually increased, although not significantly, during the last 1-year interval of the study.

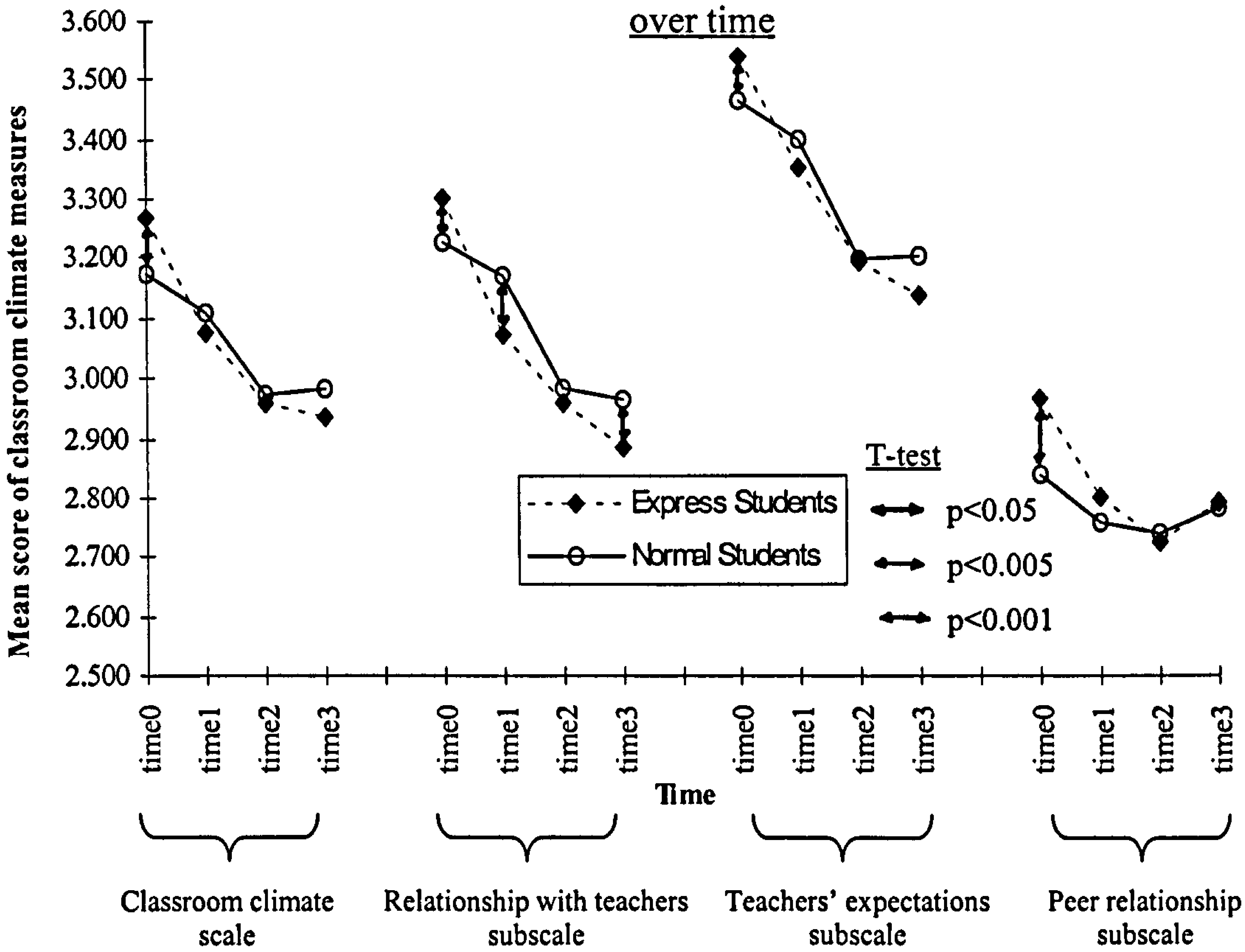
Subgroup comparisons of students' perceived classroom climate

To determine whether there was any significant difference between streams in students' perception of classroom climate, the Express and Normal students' classroom climate scores were subjected to the t-test at $time_0$, $time_1$, $time_2$ and $time_3$. The results are tabulated in Table 4.3.7 and illustrated in Figure 4.3.3.

Table 4.3.7: T-test on Express and Normal students' classroom climate scores

Variable	Time	Stream	Mean	SD	Level of Sign.
Classroom Climate	$Time_0$	Express	3.266	0.289	$p<0.005$
	$Time_0$	Normal	3.175	0.301	
	$Time_1$	Express	3.074	0.344	-
	$Time_1$	Normal	3.108	0.358	
	$Time_2$	Express	2.959	0.335	-
	$Time_2$	Normal	2.973	0.355	
	$Time_3$	Express	2.937	0.323	-
	$Time_3$	Normal	2.981	0.325	
(a) Relationship with Teachers	$Time_0$	Express	3.301	0.345	$p<0.05$
	$Time_0$	Normal	3.226	0.360	
	$Time_1$	Express	3.070	0.442	$p<0.05$
	$Time_1$	Normal	3.171	0.443	
	$Time_2$	Express	2.959	0.418	-
	$Time_2$	Normal	2.981	0.427	
	$Time_3$	Express	2.886	0.387	$p<0.05$
	$Time_3$	Normal	2.964	0.408	
(b) Teachers' Expectations	$Time_0$	Express	3.538	0.323	$p<0.05$
	$Time_0$	Normal	3.462	0.384	
	$Time_1$	Express	3.353	0.375	-
	$Time_1$	Normal	3.398	0.395	
	$Time_2$	Express	3.193	0.399	-
	$Time_2$	Normal	3.198	0.472	
	$Time_3$	Express	3.136	0.418	-
	$Time_3$	Normal	3.202	0.442	
(c) Peer Relationship	$Time_0$	Express	2.962	0.378	$p<0.001$
	$Time_0$	Normal	2.836	0.369	
	$Time_1$	Express	2.798	0.414	-
	$Time_1$	Normal	2.756	0.445	
	$Time_2$	Express	2.726	0.387	-
	$Time_2$	Normal	2.740	0.395	
	$Time_3$	Express	2.789	0.352	-
	$Time_3$	Normal	2.779	0.368	

Figure 4.3.3: Express and Normal students' classroom climate scores over time



The results in Table 4.3.7 revealed that there were significant stream effects on students' perception of classroom climate. Specifically, the Express students had significantly higher scores for the classroom climate scale and subscales at $time_0$ than the Normal students. In contrast, the Normal students had significantly higher scores for the relationship with teachers subscales at $time_1$ and $time_3$ than the Express students.

In view of the significant stream effect, the students' responses to the aforementioned scale and subscales were isolated and subjected to the t-test (Appendix 25).

The t-test revealed that at $time_0$, the Normal students were more inclined than the Express students to agree that *their teachers were only interested in the clever students in their classes* ($p<0.05$). In addition, they were more likely to agree that *their teachers felt that their class was stupid* ($p<0.05$), and *their teachers did not* *care whether they received low marks for their examinations* ($p<0.05$). They were also more disposed to disagree that *their teachers believed they could pass their 'O' level examination if they worked hard* ($p<0.01$), and *their teachers stressed the importance of doing well in examinations* ($p<0.01$). They were more inclined to agree that *their classmates often quarrelled among themselves* ($p<0.001$), and *there were groups of students who could not get along in their class* ($p<0.001$).

At $time_1$ and $time_3$, however, the Normal students were more inclined than the Express students to agree that their *teachers gave extra lessons to the weaker students* ($p<0.001$ at $time_1$), and their *teachers enjoyed mixing with them at school functions* ($p<0.01$ at $time_3$).

Subgroup comparisons of changes in students' perceived classroom climate over time

Although the scores of the Express and Normal students' classroom climate measures largely decreased over time, there was a suggestion that the declines could be less pronounced for the Normal students. To determine whether the differences in the declines were significant, the scores of the Express and Normal students' classroom climate measures were subjected to the two-way ANOVA of single factor repeated measures. The results established significant stream by time interaction effects on the scores of the classroom climate scale ($p<0.001$), relationship with teachers subscale ($p<0.001$), teachers' expectations subscale ($p<0.005$), and peer relationship subscale ($p<0.005$). On the basis of the significant interaction effects, the changes in the scores of the measures over time were computed independently for the Express and Normal students and subjected to the t-test. The results are given in Table 4.3.8.

Table 4.3.8: T-test on the changes in Express and Normal students' classroom climate scores over time

Variable	Time	Stream	Mean	Paired Diff	Level of Sign.
Classroom Climate	$Time_0$ - $Time_1$	Express	3.266 - 3.074	0.192	p<0.001
		Normal	3.175 - 3.108	0.067	
	$Time_1$ - $Time_2$	Express	3.074 - 2.959	0.115	-
		Normal	3.108 - 2.973	0.135	
	$Time_2$ - $Time_3$	Express	2.959 - 2.937	0.022	-
		Normal	2.973 - 2.981	-0.008	
	$Time_0$ - $Time_3$	Express	3.266 - 2.937	0.329	p<0.001
		Normal	3.175 - 2.981	0.194	
(a) Relationship with Teachers	$Time_0$ - $Time_1$	Express	3.301 - 3.070	0.231	p<0.001
		Normal	3.226 - 3.171	0.055	
	$Time_1$ - $Time_2$	Express	3.070 - 2.959	0.111	p<0.05
		Normal	3.171 - 2.981	0.190	
	$Time_2$ - $Time_3$	Express	2.959 - 2.886	0.073	-
		Normal	2.981 - 2.964	0.017	
	$Time_0$ - $Time_3$	Express	3.301 - 2.886	0.415	p<0.001
		Normal	3.226 - 2.964	0.262	
(b) Teachers' Expectations	$Time_0$ - $Time_1$	Express	3.538 - 3.353	0.185	p<0.005
		Normal	3.462 - 3.398	0.064	
	$Time_1$ - $Time_2$	Express	3.353 - 3.193	0.160	-
		Normal	3.398 - 3.198	0.200	
	$Time_2$ - $Time_3$	Express	3.193 - 3.136	0.057	-
		Normal	3.198 - 3.202	-0.004	
	$Time_0$ - $Time_3$	Express	3.538 - 3.136	0.402	p<0.005
		Normal	3.462 - 3.202	0.260	
(c) Peer Relationship	$Time_0$ - $Time_1$	Express	2.962 - 2.798	0.164	p<0.05
		Normal	2.836 - 2.756	0.080	
	$Time_1$ - $Time_2$	Express	2.798 - 2.726	0.072	-
		Normal	2.756 - 2.740	0.016	
	$Time_2$ - $Time_3$	Express	2.726 - 2.789	-0.063	-
		Normal	2.740 - 2.779	-0.039	
	$Time_0$ - $Time_3$	Express	2.962 - 2.789	0.173	p<0.01
		Normal	2.836 - 2.779	0.057	

The results in Table 4.3.8 revealed that the declines of the scores of the Normal students' classroom climate measures, especially from $time_0$ to $time_1$, and $time_0$ to $time_3$, were significantly less than that of the Express students.

4.3.4 Lower Express and Higher Normal Students

Developmental changes in Lower Express students' perceived classroom climate

The scores of the Lower Express students' classroom climate measures were computed and subjected to the ANOVA of single factor repeated measures. The ANOVA established significant time effects at 0.001 levels on the scores of repeated measures of the classroom climate scale and subscales. Thus, the scores of the measures were further subjected to the paired t-test. The results are given in Table 4.3.9.

Table 4.3.9: Paired t-test on Lower Express students' classroom climate scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Classroom Climate	$Time_0$ $Time_1$	3.309 3.118	0.191	0.297	p<0.001
	$Time_1$ $Time_2$	3.118 2.979	0.139	0.305	p<0.001
	$Time_2$ $Time_3$	2.979 2.947	0.032	0.325	-
	$Time_0$ $Time_3$	3.309 2.947	0.362	0.371	p<0.001
(a) Relationship with Teachers	$Time_0$ $Time_1$	3.349 3.175	0.174	0.407	p<0.001
	$Time_1$ $Time_2$	3.175 3.027	0.148	0.423	p<0.005
	$Time_2$ $Time_3$	3.027 2.936	0.091	0.454	-
	$Time_0$ $Time_3$	3.349 2.936	0.413	0.417	p<0.001
(b) Teachers' Expectations	$Time_0$ $Time_1$	3.569 3.375	0.194	0.325	p<0.001
	$Time_1$ $Time_2$	3.375 3.215	0.160	0.364	p<0.001
	$Time_2$ $Time_3$	3.215 3.142	0.073	0.414	-
	$Time_0$ $Time_3$	3.569 3.142	0.427	0.473	p<0.001
(c) Peer Relationship	$Time_0$ $Time_1$	3.008 2.803	0.205	0.423	p<0.001
	$Time_1$ $Time_2$	2.803 2.694	0.109	0.405	-
	$Time_2$ $Time_3$	2.694 2.764	-0.070	0.418	-
	$Time_0$ $Time_3$	3.008 2.764	0.244	0.478	p<0.001

The results in Table 4.3.9 revealed that the general trend of the Lower Express students was comparable with that of the overall sample in that the scores of the classroom climate measures were relatively high, and most of them declined over time. In addition, similar to that of the overall sample, most of the non-significant declines were documented for the last 1-year interval, namely, from $time_2$ to $time_3$.

Developmental changes in Higher Normal students' perceived classroom climate

The aforementioned procedures were repeated for the Higher Normal students. In this case, the ANOVA of single factor repeated measures established significant time effects at 0.001 levels on the scores of the classroom climate scale, relationship with teachers subscale, and teachers' expectations subscale, but not on the peer relationship subscale. In view of the significant time effects, the scores of the measures were further subjected to the paired t-test (see Table 4.3.10 on the following page).

The results from Table 4.3.10 revealed that the general pattern of the Higher Normal students was unlike that of the overall sample and Lower Express students, but similar to that of the Normal students. Essentially, for the Higher Normal students, the declines for the first 1-year interval, and the changes of the scores of the peer relationship subscale over the 3-year period failed to reach statistical significance. In addition, the scores of their classroom climate measures actually increased, although not significantly, during the last 1-year interval of the study.

Table 4.3.10: Paired t-test on Higher Normal students' classroom climate scores

Variable	Time	Mean	Paired Diff Mean	Paired Diff SD	Level of Sign.
Classroom Climate	$Time_0$ $Time_1$	3.109 3.072	0.037	0.317	-
	$Time_1$ $Time_2$	3.072 2.922	0.150	0.399	$p<0.005$
	$Time_2$ $Time_3$	2.922 2.999	-0.077	0.347	-
	$Time_0$ $Time_3$	3.109 2.999	0.110	0.364	-
(a) Relationship with Teachers	$Time_0$ $Time_1$	3.162 3.116	0.046	0.383	-
	$Time_1$ $Time_2$	3.116 2.895	0.221	0.462	$p<0.001$
	$Time_2$ $Time_3$	2.895 2.948	-0.053	0.448	-
	$Time_0$ $Time_3$	3.162 2.948	0.214	0.421	$p<0.001$
(b) Teachers' Expectations	$Time_0$ $Time_1$	3.429 3.367	0.062	0.405	-
	$Time_1$ $Time_2$	3.367 3.143	0.224	0.611	$p<0.005$
	$Time_2$ $Time_3$	3.143 3.195	-0.052	0.516	-
	$Time_0$ $Time_3$	3.429 3.195	0.234	0.544	$p<0.005$
(c) Peer Relationship *	$Time_0$ $Time_1$	2.737 2.734	0.003	0.459	-
	$Time_1$ $Time_2$	2.734 2.729	0.005	0.450	-
	$Time_2$ $Time_3$	2.729 2.855	-0.126	0.453	-
	$Time_0$ $Time_3$	2.737 2.855	-0.118	0.461	-

Note:

* ANOVA not significant

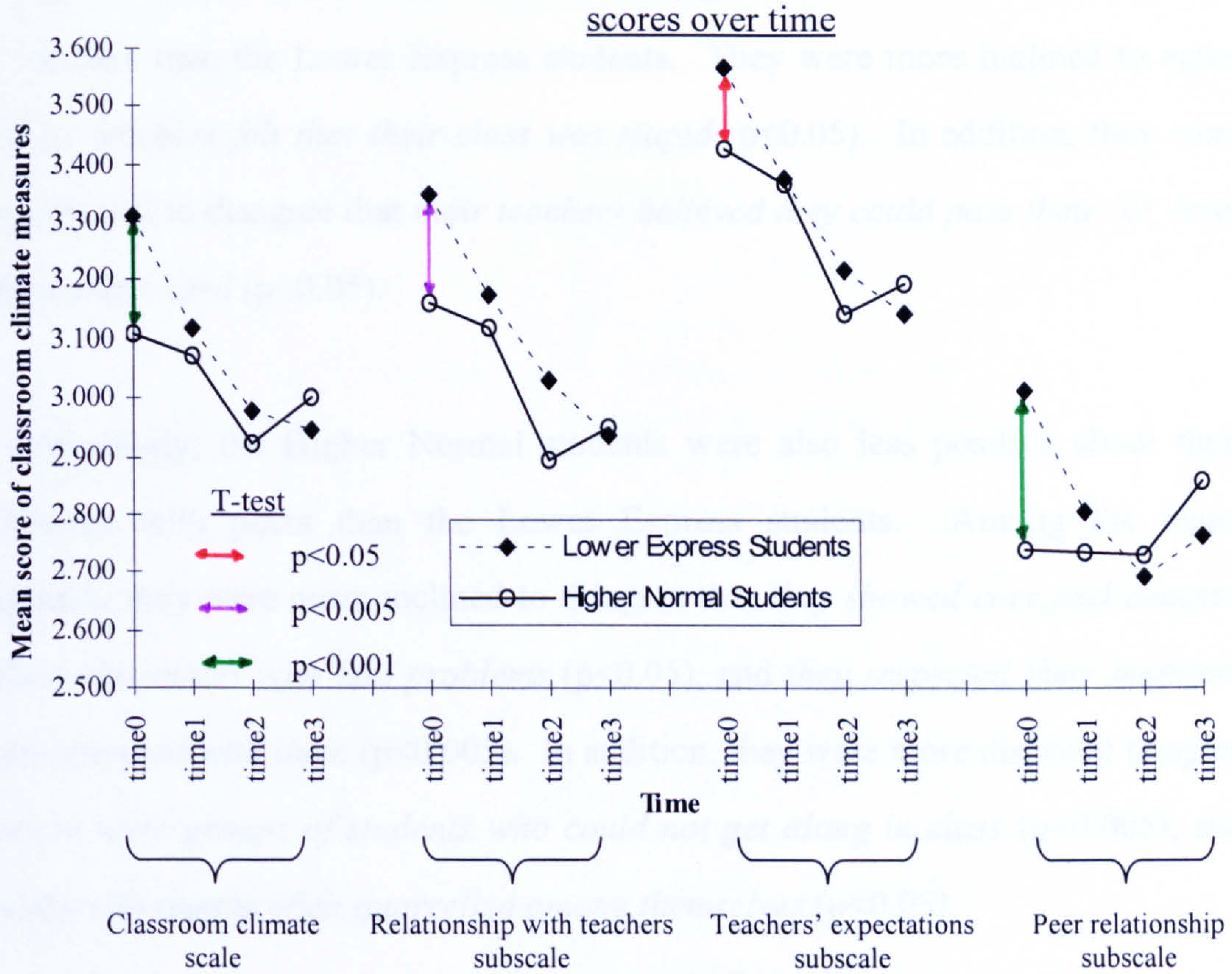
Subgroup comparisons of students' perceived classroom climate

In an attempt to determine whether there was any significant difference between the Lower Express and Higher Normal students in their perceived classroom climate, the scores of the classroom climate measures of the two subgroups of students were subjected to the t-test at $time_0$, $time_1$, $time_2$ and $time_3$. The results are given in Table 4.3.11 and illustrated in Figure 4.3.4.

Table 4.3.11: T-test on Lower Express and Higher Normal students' classroom climate scores

Variable	Time	Stream	Mean	SD	Level of Sign.
Classroom Climate	$Time_0$	Lower Express	3.309	0.275	p<0.001
	$Time_0$	Higher Normal	3.109	0.312	
	$Time_1$	Lower Express	3.118	0.349	-
	$Time_1$	Higher Normal	3.072	0.363	
	$Time_2$	Lower Express	2.979	0.351	-
	$Time_2$	Higher Normal	2.922	0.405	
	$Time_3$	Lower Express	2.947	0.332	-
	$Time_3$	Higher Normal	2.999	0.313	
(a) Relationship with Teachers	$Time_0$	Lower Express	3.349	0.320	p<0.005
	$Time_0$	Higher Normal	3.162	0.342	
	$Time_1$	Lower Express	3.175	0.414	-
	$Time_1$	Higher Normal	3.116	0.459	
	$Time_2$	Lower Express	3.027	0.431	-
	$Time_2$	Higher Normal	2.895	0.424	
	$Time_3$	Lower Express	2.936	0.368	-
	$Time_3$	Higher Normal	2.948	0.399	
(b) Teachers' Expectations	$Time_0$	Lower Express	3.569	0.308	p<0.05
	$Time_0$	Higher Normal	3.429	0.425	
	$Time_1$	Lower Express	3.375	0.370	-
	$Time_1$	Higher Normal	3.367	0.431	
	$Time_2$	Lower Express	3.215	0.418	-
	$Time_2$	Higher Normal	3.143	0.591	
	$Time_3$	Lower Express	3.142	0.439	-
	$Time_3$	Higher Normal	3.195	0.439	
(c) Peer Relationship	$Time_0$	Lower Express	3.008	0.354	p<0.001
	$Time_0$	Higher Normal	2.737	0.398	
	$Time_1$	Lower Express	2.803	0.452	-
	$Time_1$	Higher Normal	2.734	0.435	
	$Time_2$	Lower Express	2.694	0.419	-
	$Time_2$	Higher Normal	2.729	0.409	
	$Time_3$	Lower Express	2.764	0.381	-
	$Time_3$	Higher Normal	2.855	0.357	

Figure 4.3.4: Lower Express and Higher Normal students' classroom climate scores over time



The results in Table 4.3.11 revealed that the Higher Normal students had significantly lower scores for the classroom climate scale and subscales at $time_0$ than the Lower Express students.

In view of the significant stream effects, the students' responses to the classroom climate scale and subscales at $time_0$ were isolated and subjected to the t-test (Appendix 26).

The t-test revealed that at $time_0$, the Higher Normal students were significantly less positive about their relationship with teachers than the Lower Express students. They were more inclined to agree that *their teachers did not trust them* ($p<0.05$), and *their teachers were only interested in the clever students in their class* ($p<0.01$). In addition, they were more disposed to disagree that *their teachers tried to get to know them* ($p<0.01$), and *they found it easy to talk to their teachers about their problems* ($p<0.005$).

The Higher Normal students were likewise less positive about the expectations of their teachers than the Lower Express students. They were more inclined to agree that *their teachers felt that their class was stupid* ($p<0.05$). In addition, they were more disposed to disagree that *their teachers believed they could pass their 'O' level if they worked hard* ($p<0.05$).

Not surprisingly, the Higher Normal students were also less positive about their relationship with peers than the Lower Express students. Among the many differences, they were more inclined to disagree that *they showed care and concern for their classmates who had problems* ($p<0.05$), and *they respected their monitors and co-operated with them* ($p<0.005$). In addition, they were more disposed to agree that *there were groups of students who could not get along in class* ($p<0.005$), and that *some classmates often quarrelled among themselves* ($p<0.05$).

Subgroup comparisons of changes in students' perceived classroom climate over time

As noted earlier in the section, the general trend of the Higher Normal students appeared unlike that of the overall sample and Lower Express students. To establish whether the differences in the changes over time were significantly different between the Lower Express and Higher Normal students, the scores of the students' classroom climate measures were subjected to the two-way ANOVA of single factor repeated measures. The ANOVA revealed significant stream by time interaction effects on the scores of the classroom climate scale ($p<0.001$), relationship with teachers subscale ($p<0.05$), and peer relationship subscale ($p<0.001$), but not on the teachers' expectations subscale. In view of the significant interaction effects, the changes in the scores of the classroom climate measures over time were computed independently for both subgroups of students and subjected to the t-test. The results are tabulated in Table 4.3.12.

Table 4.3.12: T-test on the changes in Lower Express and Higher Normal students' classroom climate scores over time

Variable	Time	Stream	Mean	Paired Diff	Level of Sign.
Classroom Climate	$Time_0$ - $Time_1$	Lower Express	3.309 - 3.118	0.191	p<0.005
		Higher Normal	3.109 - 3.072	0.037	
	$Time_1$ - $Time_2$	Lower Express	3.118 - 2.979	0.139	-
		Higher Normal	3.072 - 2.922	0.150	
	$Time_2$ - $Time_3$	Lower Express	2.979 - 2.947	0.032	p<0.05
		Higher Normal	2.922 - 2.999	-0.077	
	$Time_0$ - $Time_3$	Lower Express	3.309 - 2.947	0.362	p<0.001
		Higher Normal	3.109 - 2.999	0.110	
(b) Relationship with Teachers	$Time_0$ - $Time_1$	Lower Express	3.349 - 3.175	0.174	p<0.05
		Higher Normal	3.162 - 3.116	0.046	
	$Time_1$ - $Time_2$	Lower Express	3.175 - 3.027	0.148	-
		Higher Normal	3.116 - 2.895	0.221	
	$Time_2$ - $Time_3$	Lower Express	3.027 - 2.936	0.091	-
		Higher Normal	2.895 - 2.948	-0.053	
	$Time_0$ - $Time_3$	Lower Express	3.349 - 2.936	0.413	p<0.005
		Higher Normal	3.162 - 2.948	0.214	
(b) Teachers' Expectations *	$Time_0$ - $Time_1$	Lower Express	3.569 - 3.375	0.194	p<0.05
		Higher Normal	3.429 - 3.367	0.062	
	$Time_1$ - $Time_2$	Lower Express	3.375 - 3.215	0.160	-
		Higher Normal	3.367 - 3.143	0.224	
	$Time_2$ - $Time_3$	Lower Express	3.215 - 3.142	0.073	-
		Higher Normal	3.143 - 3.195	-0.052	
	$Time_0$ - $Time_3$	Lower Express	3.569 - 3.142	0.427	p<0.05
		Higher Normal	3.429 - 3.195	0.234	
(c) Peer Relationship	$Time_0$ - $Time_1$	Lower Express	3.008 - 2.803	0.205	p<0.01
		Higher Normal	2.737 - 2.734	0.003	
	$Time_1$ - $Time_2$	Lower Express	2.803 - 2.694	0.109	-
		Higher Normal	2.734 - 2.729	0.005	
	$Time_2$ - $Time_3$	Lower Express	2.694 - 2.764	-0.070	-
		Higher Normal	2.729 - 2.855	-0.126	
	$Time_0$ - $Time_3$	Lower Express	3.008 - 2.764	0.244	p<0.001
		Higher Normal	2.737 - 2.855	-0.118	

Note:

* Two-way ANOVA not significant

The results, as shown in Table 4.3.12, revealed significant differences between the two subgroups of students in the changes in their perception of classroom climate over time. Essentially, the declines of the scores of the Higher Normal students' classroom climate scale, relationship with teachers subscale, and peer relationship subscale, especially from $time_0$ to $time_1$, and $time_0$ to $time_3$, were significantly less than that of the Lower Express students. Since no significant subgroup by time interaction effect was established on the scores of the teachers' expectations subscale by the two-way ANOVA, the two significant differences detected by the t-test were dismissed as type I errors.

4.3.5 Summary of Key Findings

- Generally, the scores of the classroom climate measures of the students declined over time for the overall 3-year period, and for the first and second 1-year intervals of the study. However, for the Normal and Higher Normal students, most of the declines for the first 1-year interval, and all the changes in the scores of the peer relationship subscale over the 3-year period failed to reach statistical significance. In addition, most of the scores of their classroom climate measures actually increased, although not significantly, during the last 1-year interval of the study.

- There were significant gender effects, in favour of female students, on the scores of the peer relationship subscales at $time_0$, $time_2$ and $time_3$.

- There were significant and contrasting stream effects on the scores of the students' classroom climate measures at different points in time of the study. Specifically, the Express and Lower Express students had significantly higher scores for the classroom climate scale and subscales at $time_0$ than the Normal and Higher Normal students respectively. In contrast, the Normal students had significantly higher scores for the relationship with teachers subscales at $time_1$ and $time_3$ than the Express students.

- There were significant differences between Express and Normal students, and Lower Express and Higher Normal students in the changes in the scores of their classroom climate measures over time. Essentially, most of the scores of the Express and Lower Express students' classroom climate scale and subscales declined significantly more than that of the Normal and Higher Normal students respectively in the first 1-year interval and the overall 3-year period.

4.4 Relationships between Students' Academic Self-Concept and their Perceived Home Environment and Classroom Climate

The data analysis in this section was tailored to answer two broad categories of research questions pertaining to relationships between students' academic self-concept and their perceived home environment and classroom climate, and subgroup comparisons by gender, ability stream and marginal ability stream of the relationships (see Section 2.8).

4.4.1 Overall Sample

To establish the strength of the relationships between students' academic self-concept and their perceived home environment and classroom climate, the Pearson product-moment correlations of the overall sample were computed at different points in time, namely, $time_0$, $time_1$, $time_2$ and $time_3$, and tabulated in Table 4.4.1.

Table 4.4.1: Correlations between students' academic self-concept scores and their home environment and classroom climate scores

		Home	RelatP	SupporA	Class	RelatT	TExpect	Peer
$Time_0$	Self	54	49	50	61	53	52	46
	Confid	45	41	43	48	40	40	39
	Effort	48	44	44	57	51	50	40
$Time_1$	Self	53	49	50	59	46	53	49
	Confid	44	40	41	52	41	45	44
	Effort	51	47	48	52	41	48	42
$Time_2$	Self	50	45	49	48	40	44	36
	Confid	40	34	43	37	30	32	29
	Effort	47	44	44	48	40	44	34
$Time_3$	Self	58	56	52	55	48	48	38
	Confid	45	43	41	47	44	40	30
	Effort	57	56	51	51	43	45	37

Note:

(a) Abbreviations:

Home : Home Environment
RelatP : Relationship with Parents
SupporA : Academic Support

Class : Classroom Climate
RelatT : Relationship with Teachers
TExpect : Teachers' Expectations
Peer : Peer Relationship

Self : Academic Self-Concept
Confid : Students' Confidence
Effort : Students' Effort

(b) Correlations are presented without the decimal points.

(c) All correlations are significant at 0.001 level.

From Table 4.4.1, it is evident that there were positive and significant relationships between students' academic self-concept and their perception of home environment at all point in time throughout the study. Specifically, consistent and moderate relationships were found between the scores of the academic self-concept scale and the scores of the home environment scale ($0.50 \leq r \leq 0.58$), relationship with parents subscale ($0.45 \leq r \leq 0.56$), and academic support subscale ($0.49 \leq r \leq 0.52$). In addition, similar relationships were documented for the scores of the students' academic self-concept subscales, namely, students' confidence subscale ($0.34 \leq r \leq 0.45$) and students' effort subscale ($0.44 \leq r \leq 0.57$), and the scores of their home environment measures.

The results in Table 4.4.1 also established positive and significant relationships between students' academic self-concept and their perception of classroom climate at all point in time throughout the study. Specifically, consistent and moderate relationships were found between the scores of the academic self-concept scale and the scores of the classroom climate scale ($0.48 \leq r \leq 0.61$), relationship with teachers subscale ($0.40 \leq r \leq 0.53$), teachers' expectations subscale ($0.44 \leq r \leq 0.53$), and peer relationship subscale ($0.36 \leq r \leq 0.49$). In addition, similar relationships were documented for the scores of the students' academic self-concept subscales, namely, students' confidence subscale ($0.29 \leq r \leq 0.52$) and students' effort subscale ($0.34 \leq r \leq 0.57$), and the scores of the classroom climate measures.

4.4.2 Male and Female Students

To establish whether there was any significant difference between genders in the relationships, the Pearson product-moment correlations were determined for the male and female students independently at different points in time and subjected to the Fisher's z_r transformation. The results are given in Table 4.4.2 on page 193.

As shown in Table 4.4.2, the relationships between the academic self-concept scores and the home environment scores of both genders were similar to that of the overall sample. Specifically, significant and moderate relationships were established between the male students' academic self-concept scores and their home environment scores ($0.37 \leq r \leq 0.57$), and between the female students' academic self-concept scores and their home environment scores ($0.32 \leq r \leq 0.62$). Despite the similarities between genders, the correlations of the students' effort subscale, especially at the end of Secondary 2, appeared to be stronger for the female students than the male students. In fact, the gender effect on the relationships between the scores of the students' effort subscale and home environment scale at time$_2$ reached statistical significance.

Table 4.4.2: Correlations between male and female students' academic self-concept scores and their home environment and classroom climate scores

		Gender	Home	RelatP	SupporA	Class	RelatT	TExpect	Peer
$Time_0$	Self	Male	52	48	47	57	46	49	43
		Female	56	49	54	65	[60]	56	48
	Confid	Male	45	41	42	45	34	39	37
		Female	47	42	45	53	48	41	44
	Effort	Male	44	42	38	52	45	45	36
		Female	51	45	50	61	[58]	57	41
$Time_1$	Self	Male	56	52	51	59	45	55	49
		Female	51	47	50	59	49	51	49
	Confid	Male	48	46	43	52	39	48	43
		Female	39	35	39	52	42	42	47
	Effort	Male	50	47	47	53	40	49	43
		Female	52	48	50	53	45	48	40
$Time_2$	Self	Male	46	43	45	52	41	50	38
		Female	54	47	55	44	39	[35]	32
	Confid	Male	41	37	40	41	31	39	33
		Female	40	32	46	32	29	24	27
	Effort	Male	41	38	38	50	41	49	35
		Female	[55]	52	52	45	41	39	30
$Time_3$	Self	Male	57	55	51	54	48	47	40
		Female	59	56	53	55	50	48	34
	Confid	Male	46	46	41	45	40	39	34
		Female	44	41	41	49	48	42	29
	Effort	Male	55	53	50	52	46	46	38
		Female	62	60	54	49	42	45	33

Note:

(a) Abbreviations:

Home : Home Environment
RelatP : Relationship with Parents
SupporA : Academic Support

Class : Classroom Climate
RelatT : Relationship with Teachers
TExpect : Teachers' Expectations
Peer : Peer Relationship

Self : Academic Self-Concept
Confid : Students' Confidence
Effort : Students' Effort

(b) Correlations are presented without the decimal points.

(c) All correlations are significant at 0.001 level.

(d) [ ] $p<0.05$

The results in Table 4.4.2 also revealed that the relationships between the academic self-concept scores and the classroom climate scores of both genders were similar to that of the overall sample. Specifically, significant and moderate relationships were established between the male students' academic self-concept scores and their classroom climate scores ($0.31 \leq r \leq 0.59$), and between the female students' academic self-concept scores and their classroom climate scores ($0.24 \leq r \leq 0.65$). Despite the similarities between genders, there were significant gender effects on the relationships. Specifically, the Fisher's z_r transformation revealed that the relationships between the scores of the academic self-concept scale and relationship with teachers subscale, and between the scores of the students' effort subscale and relationship with teachers subscale at $time_0$ were significantly stronger for the female students than the male students. In contrast, the relationship between the scores of the academic self-concept scale and teachers' expectations subscale at $time_2$ was significantly stronger for the male students than the female students.

4.4.3 Express and Normal Students

Similar to that of the male and female students, the Pearson product-moment correlations of the Express and Normal students were computed independently at different points in time and subjected to the Fisher's z_r transformation. The results are given in Table 4.4.3.

Table 4.4.3: Correlations between Express and Normal students' academic self-concept scores and their home environment and classroom climate scores

		Stream	Home	RelatP	SupporA	Class	RelatT	TExpect	Peer
$Time_0$	Self	Express	54	48	50	60	52	52	47
		Normal	54	49	51	60	54	52	41
	Confid	Express	44	38	43	44	37	36	37
		Normal	47	43	44	53	44	44	41
	Effort	Express	49	46	44	60	53	54	45
		Normal	46	41	43	51	49	45	30
$Time_1$	Self	Express	52	48	50	61	48	56	52
		Normal	55	52	52	56	46	49	46
	Confid	Express	41	38	39	53	40	46	49
		Normal	46	43	44	50	43	44	38
	Effort	Express	51	47	49	55	44	53	43
		Normal	50	47	47	48	37	42	42
$Time_2$	Self	Express	53	47	54	48	40	44	37
		Normal	46	42	44	48	40	45	34
	Confid	Express	42	34	46	36	30	31	29
		Normal	39	34	40	38	30	35	29
	Effort	Express	[54]	50	[51]	51	42	47	38
		Normal	38	37	35	43	37	41	28
$Time_3$	Self	Express	54	53	48	52	47	42	42
		Normal	61	60	56	57	49	54	33
	Confid	Express	43	41	39	43	42	33	35
		Normal	48	47	43	50	46	[48]	25
	Effort	Express	54	53	46	49	43	42	40
		Normal	62	60	57	53	42	49	34

Note:

(a) Abbreviations:

Home : Home Environment
RelatP : Relationship with Parents
SupporA : Academic Support

Class : Classroom Climate
RelatT : Relationship with Teachers
TExpect : Teachers' Expectations
Peer : Peer Relationship

Self : Academic Self-Concept
Confid : Students' Confidence
Effort : Students' Effort

(b) Correlations are presented without the decimal points.

(c) All correlations are significant at 0.001 level.

(d) [ ] $p<0.05$

From Table 4.4.3, it is evident that the relationships between the academic self-concept scores and the home environment scores of the Express and Normal students were consistent with that of the overall sample. Specifically, significant and moderate relationships were established between the Express students' academic self-concept scores and their home environment scores ($0.34 \leq r \leq 0.54$), and between the Normal students' academic self-concept scores and their home environment scores ($0.34 \leq r \leq 0.62$). Despite the similarities between the ability streams, there were significant stream effects on the relationships at time$_2$. Namely, the relationships between the scores of the students' effort subscale and home environment scale, and between the scores of the students' effort subscale and academic support subscale were significantly stronger for the Express students than the Normal students.

The results in Table 4.4.3 also revealed that the relationships between the academic self-concept scores and the classroom climate scores of both the Express and Normal students were largely comparable with that of the overall sample. Specifically, significant and moderate relationships were found between the Express students' academic self-concept scores and their classroom climate scores ($0.29 \leq r \leq 0.61$), and between the Normal students' academic self-concept scores and their classroom climate scores ($0.25 \leq r \leq 0.60$). In this case, only the relationship between the scores of the students' confidence subscale and teachers' expectations subscale at time$_3$ was significantly stronger for the Normal students than the Express students.

4.4.4 Lower Express and Higher Normal Students

Similar to that of the Express and Normal students, the Pearson product-moment correlations of the Lower Express and Higher Normal students were computed independently at different points in time and subjected to the Fisher's z_r transformation. The results are given in Table 4.4.4.

Table 4.4.4: Correlations between Lower Express and Higher Normal students' academic self-concept scores and their home environment and classroom climate scores

		Stream	Home	RelatP	SupporA	Class	RelatT	TExpect	Peer
$Time_0$	Self	Lower Express	58	54	54	57	55	50	41
		Higher Normal	62	57	56	51	52	* 41	# 32
	Confid	Lower Express	52	47	49	43	42	* 35	* 35
		Higher Normal	46	45	* 39	49	* 42	* 41	* 35
	Effort	Lower Express	52	49	47	59	56	55	41
		Higher Normal	55	49	52	* 36	43	^ 27	~ 19
$Time_1$	Self	Lower Express	61	54	63	70	62	60	56
		Higher Normal	56	55	50	48	# 34	52	# 34
	Confid	Lower Express	55	50	56	58	51	44	52
		Higher Normal	48	45	45	46	* 38	50	^ 25
	Effort	Lower Express	56	48	58	68	61	65	49
		Higher Normal	49	51	* 41	* 38	~ 20	* 40	# 33
$Time_2$	Self	Lower Express	52	43	56	51	47	51	# 28
		Higher Normal	52	49	50	44	* 35	# 34	45
	Confid	Lower Express	44	36	50	41	39	41	^ 22
		Higher Normal	47	47	* 41	# 34	^ 27	^ 27	* 35
	Effort	Lower Express	53	45	55	54	49	55	* 30
		Higher Normal	45	* 40	45	* 42	# 34	# 32	* 42
$Time_3$	Self	Lower Express	61	57	56	56	55	41	45
		Higher Normal	65	64	59	51	52	43	^ 24
	Confid	Lower Express	55	51	52	43	43	# 29	38
		Higher Normal	* 39	* 38	* 36	* 39	43	^ 27	~ 21
	Effort	Lower Express	57	53	51	59	57	47	44
		Higher Normal	74	73	66	51	49	47	~ 22

Note:

(a) Abbreviations:

Home : Home Environment
RelatP : Relationship with Parents
SupporA : Academic Support

Class : Classroom Climate
RelatT : Relationship with Teachers
TExpect : Teachers' Expectations
Peer : Peer Relationship

Self : Academic Self-Concept
Confid : Students' Confidence
Effort : Students' Effort

(b) Correlations are presented without the decimal points.

(c) All correlations are significant with $p<0.001$, except when denoted by the following:
* $p<0.005$ # $p<0.01$ ^ $p<0.05$ ~ p is not significant

(d) ( ) $p<0.05$; [ ] $p<0.01$ and { } $p<0.005$

From Table 4.4.4, it is apparent that the relationships between the academic self-concept scores and the home environment scores of the Lower Express and Higher Normal students were similar to that of the overall sample. Specifically, significant and moderate relationships were established between the Lower Express students' academic self-concept scores and their home environment scores ($0.36 \leq r \leq 0.63$), and between the Higher Normal students' academic self-concept scores and their home environment scores ($0.36 \leq r \leq 0.74$). Despite the similarities between the two subgroups of students, the Higher Normal students appeared to have stronger relationships between the scores of the students' effort subscale and home environment measures at $time_3$ than the Lower Express students. In fact, the difference was significant in the relationship between the scores of the students' effort subscale and relationship with parents subscale.

In contrast to the aforementioned results, the results in Table 4.4.4 showed a different picture for the correlations of the Lower Express and Higher Normal students' classroom climate scores. Although significant relationships were established between the Lower Express students' academic self-concept scores and their classroom climate scores ($0.22 \leq r \leq 0.70$), four of the relationships between the Higher Normal students' academic self-concept scores and their classroom climate scores ($0.19 \leq r \leq 0.52$) were not significant. The differences between the two subgroups of students were affirmed when the Fisher's z_r transformation established six significant stream effects, in favour of Lower Express students, on the relationships. Essentially, the Lower Express students had significantly stronger relationship between the scores of the students' effort subscale and teachers' expectations subscale at $time_0$. They also had significantly stronger relationships between the scores of the academic self-concept variables, namely, the academic self-concept scale and students' effort subscale, and several of the classroom climate variables at $time_1$.

4.4.5 Summary of Key Findings

- Significant and moderate relationships were established between the overall sample's academic self-concept scores and their home environment and classroom climate scores. Similar relationships were documented for the subgroups of students with the exception of the Higher Normal students, who had four non-significant relationships between the students' academic self-concept scores and their classroom climate scores.

- There were significant gender effects on the relationships. Specifically, the female students had significantly stronger relationship between the scores of the students' effort subscale and home environment scale at $time_2$ than the male students. They also had significantly stronger relationships between the scores of the academic self-concept variables, namely, the academic self-concept scale and students' effort subscale, and relationship with teachers subscale at $time_0$. In contrast, the male students had significantly stronger relationship between the scores of the academic self-concept scale and teachers' expectations subscale at $time_2$.

- There were significant stream effects on the relationships. Specifically, the Express students had significantly stronger relationships between the scores of the students' effort subscale and home environment variables, namely, the home environment scale and academic support subscale, at $time_2$ than the Normal students. In contrast, the Normal students had significantly stronger relationship between the scores of the students' confidence subscale and teachers' expectations subscale at $time_3$.

- There were significant differences between the Lower Express and Higher Normal students in the relationships. Specifically, the Higher Normal students had significantly stronger relationship between the scores of the students' effort subscale and relationship with parents subscale at $time_3$ than the Lower Express students. In contrast, the Lower Express students had significantly stronger relationships between the scores of the students' academic self-concept variables, namely, the academic self-concept scale and students' effort subscale, and several of the classroom climate variables at $time_0$ and $time_1$.

4.5 Predictors of Students' Academic Self-Concept

The analysis in this section was carried out to establish the predictors of students' academic self-concept (see Section 2.8). In essence, four sets of stepwise multiple linear regressions were performed on the academic self-concept variables in waves 1 to 4 of the overall sample and the different subgroups of students, namely, male and female students, Express and Normal students, and Lower Express and Higher Normal students. The first and second sets of regressions looked at the main scales: the dependent variables were the academic self-concept scales, and the predictive variables were the present environmental scales, and the past and present environmental scales respectively. The third and fourth sets of regressions looked at the subscales: the dependent variables were the academic self-concept subscales, and the predictive variables were the present environmental subscales, and the past and present environmental subscales respectively. To have a clear picture of the predictive abilities of the environmental subscales, non-environmental variables such as PSLE result, stream, gender, socio-economic status, non-verbal reasoning test score and when appropriate, class position, were also included as predictive variables in the third and fourth sets of regressions. In view of the vast number of predictive variables, it was decided that only contributions of 2% or more additional variance would be considered to have practical significance (similar to Leonardson, 1986).

4.5.1 Overall Sample

The detail regression results of the overall sample are given in Appendix 27.

The summary of the first and second sets of regressions, that is, the regressions of the present environmental main scales on the academic self-concept scales, and the regressions of the past and present environmental main scales on the academic self-concept scales respectively, is given in Table 4.5.1.

Table 4.5.1: Regression based predictors of students' overall academic self-concept

	First set of regressions		Second set of regressions	
	Predictor	**ΔR^2**	**Predictor**	**ΔR^2**
$Time_0$	Classroom Climate $_0$	0.3702		
	Home Environment $_0$	0.0778		
	Total R^2	*0.4480*		
$Time_1$	Classroom Climate $_1$	0.3465	Classroom Climate $_1$	0.3465
	Home Environment $_1$	0.0765	Home Environment $_1$	0.0765
			Home Environment $_0$	0.0066
	Total R^2	*0.4230*	*Total R^2*	*0.4296*
$Time_2$	Home Environment $_2$	0.2481	Home Environment $_2$	0.2481
	Classroom Climate $_2$	0.0893	Classroom Climate $_2$	0.0893
	Total R^2	*0.3374*	*Total R^2*	*0.3374*
$Time_3$	Home Environment $_3$	0.3308	Home Environment $_3$	0.3308
	Classroom Climate $_3$	0.0865	Classroom Climate $_3$	0.0865
			Home Environment $_2$	0.0092
	Total R^2	*0.4173*	*Total R^2*	*0.4265*

The first set of regressions, as shown on the left of Table 4.5.1, revealed that the present classroom climate and home environment scales were significant predictors of students' overall academic self-concept at all points in time during the study.

They accounted for a total of 33.74% to 44.80% of the variances. The importance of the present environmental scales as predictors was substantiated by the results of the second set of regressions, as shown on the right of Table 4.5.1. Although two of the past home environment scales were significant predictors of students' later overall academic self-concept, they only explained about an additional 1% of the variances.

A closer examination of the results in Table 4.5.1 revealed that between the present environmental scales, there appeared to be a shift in importance of predictors from the classroom climate scales to the home environment scales over the 3-year period. Specifically, the classroom climate scales were the major predictors of students' overall academic self-concept at $time_0$ and $time_1$, while the home environment scales were the major predictors at $time_2$ and $time_3$.

The summary of the third and fourth sets of regressions, that is, the regressions of the present environmental subscales on the academic self-concept subscales, and the regressions of the past and present environmental subscales on the academic self-concept subscales respectively, is given in Table 4.5.2 on the following page. The results of the third set of regressions are also illustrated in Figures 4.5.1 and 4.5.2 on page 204.

From Table 4.5.2, it is evident that most of the non-environmental variables were not significant predictors of students' confidence or students' effort. The exceptions were Secondary 1 and 2 class positions and gender. However, Secondary 1 and 2 class positions only accounted for an extra 2.93% to 3.26% of the variances, and gender only explained an additional 2.03% of the variance in students' confidence at $time_2$ in the fourth set of regressions.

Table 4.5.2: Regression based predictors of students' confidence and students' effort

	Third set of regressions				Fourth set of regressions			
	Students' confidence		Students' effort		Students' confidence		Students' effort	
	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2
$Time_0$	Academic Support $_0$	0.1865	Relationship with Teachers $_0$	0.2643				
	Peer Relationship $_0$	0.0719	Relationship with Parents $_0$	0.0656				
	Teachers' Expectations $_0$	0.0304	Teachers' Expectations $_0$	0.0422				
$Time_1$	Teachers' Expectations $_1$	0.2007	Teachers' Expectations $_1$	0.2317	Teachers' Expectations $_1$	0.2007	Teachers' Expectations $_1$	0.2317
	Relationship with Parents $_1$	0.0743	Relationship with Parents $_1$	0.1115	Relationship with Parents $_1$	0.0743	Relationship with Parents $_1$	0.1115
	Peer Relationship $_1$	0.0326			Peer Relationship $_1$	0.0326		
$Time_2$	Academic Support $_2$	0.1822	Relationship with Parents $_2$	0.1965	Academic Support $_2$	0.1822	Relationship with Parents $_2$	0.1965
	Teachers' Expectations $_2$	0.0375	Teachers' Expectations $_2$	0.1028	Teachers' Expectations $_2$	0.0375	Teachers' Expectations $_2$	0.1028
	Secondary 1 Class Position *	0.0293			Secondary 1 Class Position *	0.0293		
					Peer Relationship $_1$	0.0214		
					Gender *	0.0203		
$Time_3$	Relationship with Teachers $_3$	0.1917	Relationship with Parents $_3$	0.3117	Relationship with Teachers $_3$	0.1917	Relationship with Parents $_3$	0.3117
	Relationship with Parents $_3$	0.0820	Teachers' Expectations $_3$	0.0659	Relationship with Parents $_3$	0.0820	Teachers' Expectations $_3$	0.0659
	Secondary 2 Class Position *	0.0326			Secondary 2 Class Position *	0.0326		

Note:
* negative β value

Figure 4.5.1: Regression based predictors of students' confidence

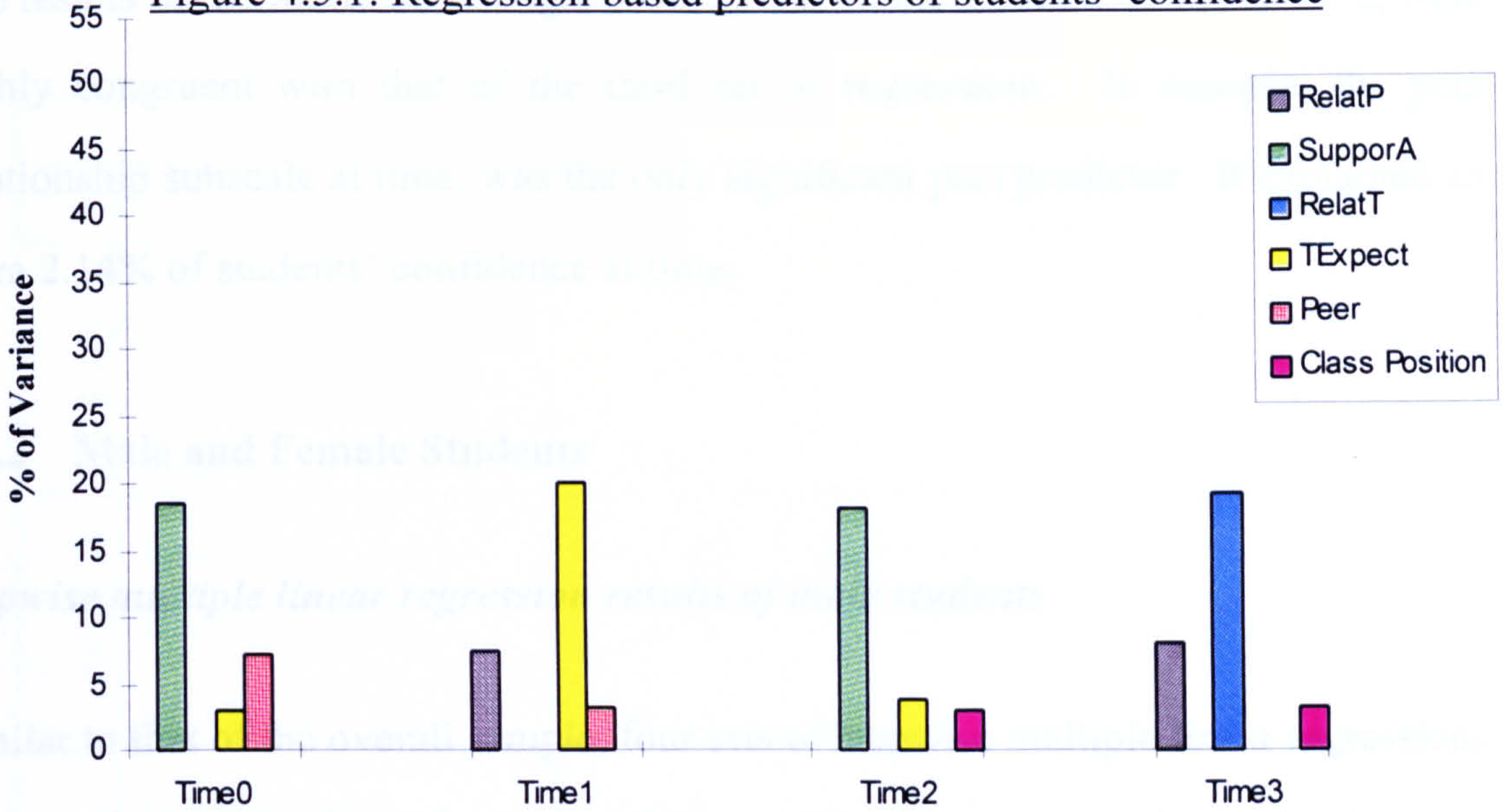
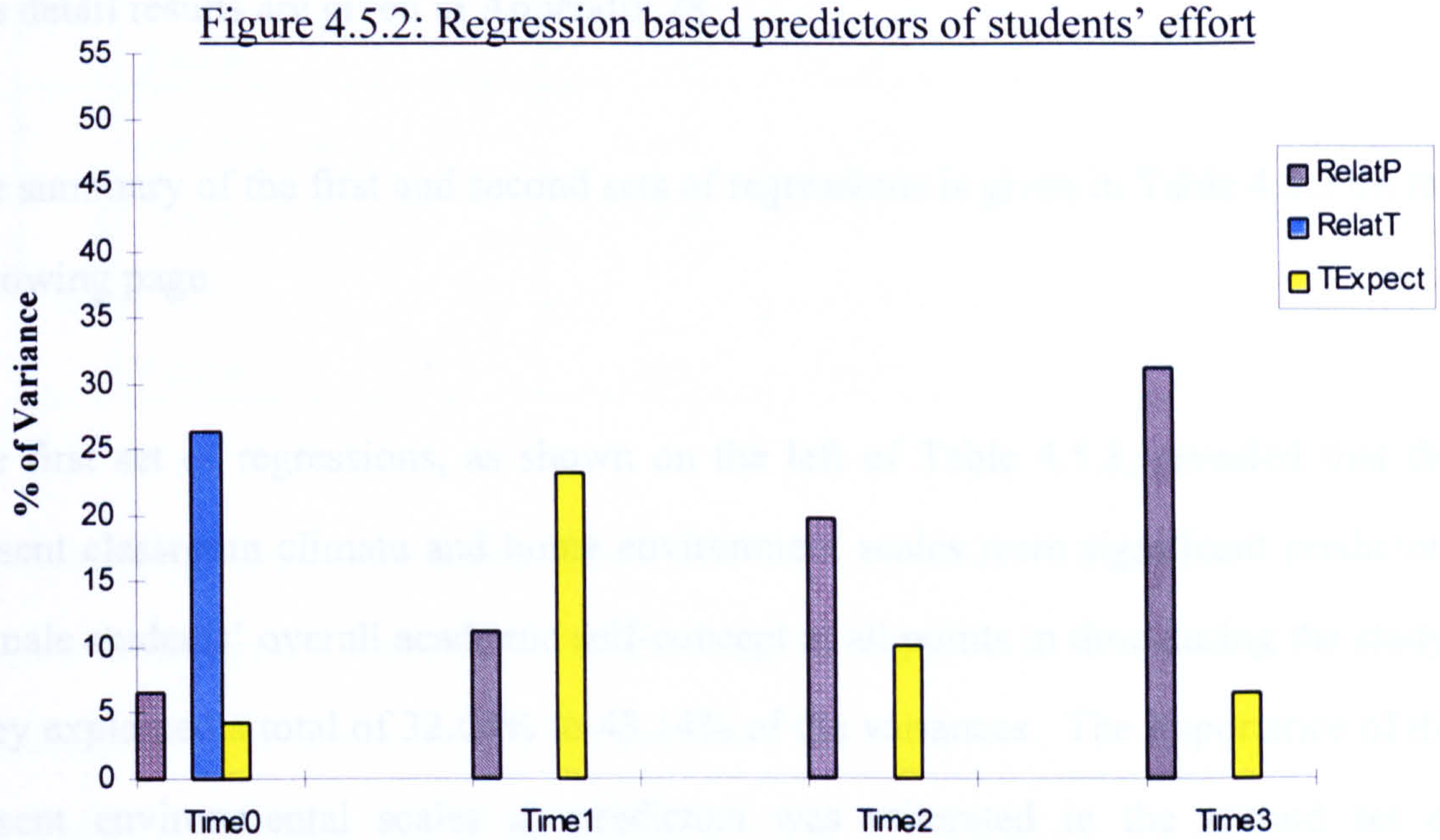


Figure 4.5.2: Regression based predictors of students' effort



For the environmental subscales, the third set of regressions, as illustrated in Figures 4.5.1 and 4.5.2, revealed that the *teachers' expectations* subscales were the most consistent predictors of students' confidence and students' effort throughout the 3-year period. The *relationship with parents* subscales were also regular predictors of students' effort. Although the other environmental subscales did not feature consistently, the *relationship with teachers* subscales were major predictors of students' effort at time$_0$ and students' confidence at time$_3$, and the *academic support* subscales were major predictors of students' confidence at time$_0$ and time$_2$.

The results of the fourth set of regression, as shown on the right of Table 4.5.2, were highly congruent with that of the third set of regressions. In essence, the peer relationship subscale at $time_1$ was the only significant past predictor. It explained an extra 2.14% of students' confidence at $time_2$.

4.5.2 Male and Female Students

Stepwise multiple linear regression results of male students

Similar to that of the overall sample, four sets of stepwise multiple linear regressions were performed on the male students' academic self-concept scales and subscales. The detail results are given in Appendix 28.

The summary of the first and second sets of regressions is given in Table 4.5.3 on the following page.

The first set of regressions, as shown on the left of Table 4.5.3, revealed that the present classroom climate and home environment scales were significant predictors of male students' overall academic self-concept at all points in time during the study. They explained a total of 32.64% to 43.14% of the variances. The importance of the present environmental scales as predictors was reiterated in the second set of regressions, as shown on the right of Table 4.5.3. Although the regressions established that the home environment scale at $time_1$ was a significant predictor of male students' later overall academic self-concept, it only explained an additional 1.20% of the variance.

Table 4.5.3: Regression based predictors of male students' overall academic self-concept

	First set of regressions		Second set of regressions	
	Predictor	**ΔR^2**	**Predictor**	**ΔR^2**
$Time_0$	Classroom Climate $_0$	0.3230		
	Home Environment $_0$	0.0857		
	Total R^2	*0.4087*		
$Time_1$	Classroom Climate $_1$	0.3492	Classroom Climate $_1$	0.3492
	Home Environment $_1$	0.0822	Home Environment $_1$	0.0822
	Total R^2	*0.4314*	*Total R^2*	0.4314
$Time_2$	Classroom Climate $_2$	0.2661	Classroom Climate $_2$	0.2661
	Home Environment $_2$	0.0603	Home Environment $_2$	0.0603
	Total R^2	*0.3264*	*Total R^2*	0.3264
$Time_3$	Home Environment $_3$	0.3208	Home Environment $_3$	0.3208
	Classroom Climate $_3$	0.0806	Classroom Climate $_3$	0.0806
			Home Environment $_1$	0.0120
	Total R^2	*0.4014*	*Total R^2*	0.4134

A closer examination of the results in Table 4.5.3 revealed that between the present environmental scales, there was a general shift in importance of predictors from the classroom climate scales to the home environment scales over the 3-year period. Specifically, the classroom climate scales were the dominant predictors of male students' overall academic self-concept at $time_0$, $time_1$ and $time_2$, while the home environment scale was the major predictor at $time_3$.

The summary of the third and fourth sets of regressions is given in Table 4.5.4 on the following page. The results of the third set of regressions are illustrated in Figures 4.5.3 and 4.5.4 on page 208.

Table 4.5.4: Regression based predictors of students' confidence and students' effort for male students

	Third set of regressions				Fourth set of regressions			
	Students' confidence		Students' effort		Students' confidence		Students' effort	
	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2
Time $_0$	Academic Support $_0$	0.1745	Relationship with Teachers $_0$	0.2061				
	Peer Relationship $_0$	0.0641	Relationship with Parents $_0$	0.0847				
	Teachers' Expectations $_0$	0.0334	Teachers' Expectations $_0$	0.0294				
Time $_1$	Teachers' Expectations $_1$	0.2256	Teachers' Expectations $_1$	0.2422	Teachers' Expectations $_1$	0.2256	Teachers' Expectations $_1$	0.2422
	Relationship with Parents $_1$	0.0978	Relationship with Parents $_1$	0.1019	Relationship with Parents $_1$	0.0978	Relationship with Parents $_1$	0.1019
Time $_2$	Academic Support $_2$	0.1634	Teachers' Expectations $_2$	0.2404	Academic Support $_2$	0.1634	Teachers' Expectations $_2$	0.2404
	Teachers' Expectations $_2$	0.0655	Academic Support $_2$	0.0445	Teachers' Expectations $_2$	0.0655	Academic Support $_2$	0.0445
	Secondary 1 Class Position *	0.0273			Secondary 1 Class Position *	0.0273		
Time $_3$	Relationship with Parents $_3$	0.2071	Relationship with Parents $_3$	0.2779	Relationship with Parents $_3$	0.2071	Relationship with Parents $_3$	0.2779
	Secondary 2 Class Position *	0.0553	Relationship with Teachers $_3$	0.0703	Secondary 2 Class Position *	0.0553	Relationship with Teachers $_3$	0.0703
	Relationship with Teachers $_3$	0.0419	Secondary 2 Class Position *	0.0251	Relationship with Teachers $_3$	0.0419	Academic Support $_1$	0.0261
							Secondary 2 Class Position *	0.0223

Note:
* negative β value

Figure 4.5.3: Regression based predictors of students' confidence for male students

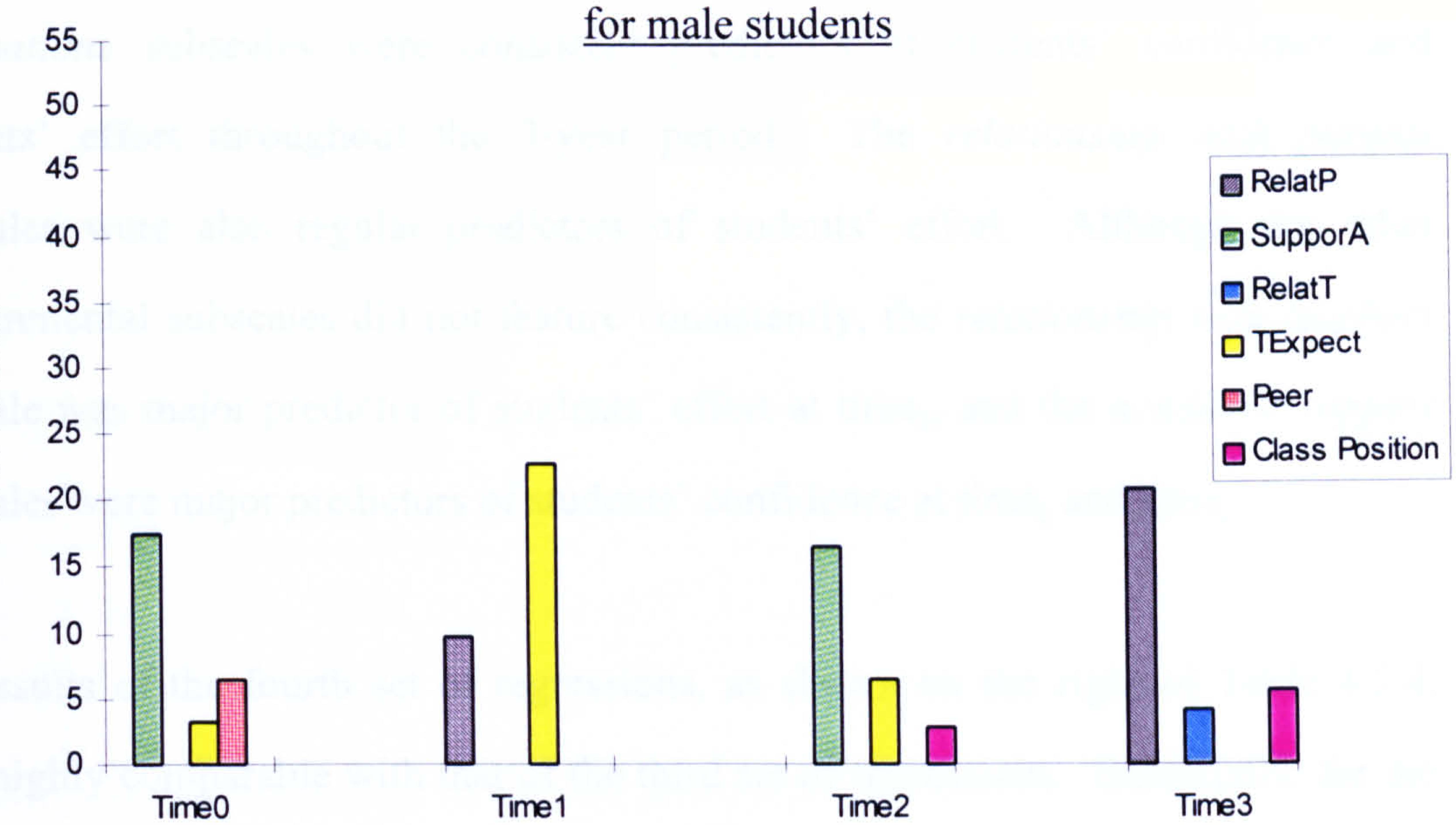
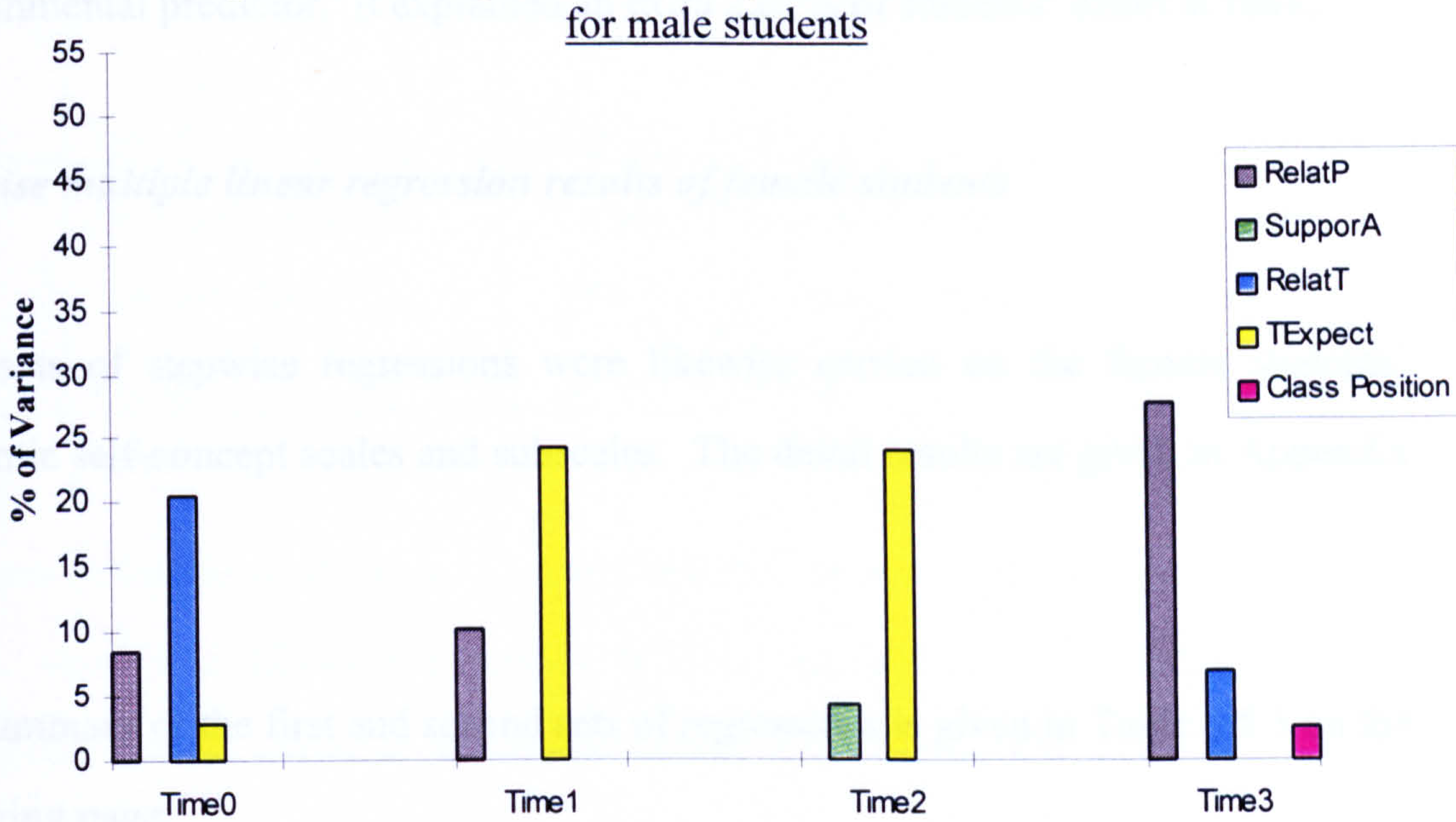


Figure 4.5.4: Regression based predictors of students' effort for male students



Similar to that of the overall sample, the results in Table 4.5.4 established that for the male students, most of the non-environmental variables were not significant predictors of students' confidence or students' effort. The only exceptions were Secondary 1 and 2 class positions. However, they were only able to explain an additional 2.23% to 5.53% of the variances.

With regard to the environmental subscales, the third set of regressions, as illustrated in Figures 4.5.3 and 4.5.4, revealed that for the male students, the *teachers'* *expectations* subscales were consistent predictors of students' confidence and students' effort throughout the 3-year period. The *relationship with parents* subscales were also regular predictors of students' effort. Although the other environmental subscales did not feature consistently, the *relationship with teachers* subscale was major predictor of students' effort at $time_0$, and the *academic support* subscales were major predictors of students' confidence at $time_0$ and $time_2$.

The results of the fourth set of regressions, as shown on the right of Table 4.5.4, were highly comparable with that of the third set of regressions. Essentially, for the male students, the academic support subscale at $time_1$ was the only significant past environmental predictor. It explained an extra 2.61% of students' effort at $time_3$.

Stepwise multiple linear regression results of female students

Four sets of stepwise regressions were likewise carried on the female students' academic self-concept scales and subscales. The detail results are given in Appendix 29.

The summary of the first and second sets of regressions is given in Table 4.5.5 on the following page.

The first set of regressions, as shown on the left of Table 4.5.5, revealed that the present classroom climate and home environment scales were significant predictors of female students' overall academic self-concept at all points in time during the study. They explained a total of 36.13% to 48.90% of the variances. The importance of the present environmental scales as predictors was supported in the second set of regressions, as shown on the right of Table 4.5.5. Although the classroom climate scale at $time_1$ was a significant predictor of female students' later overall academic self-concept, it only explained an additional 1.37% of the variance.

Table 4.5.5: Regression based predictors of female students' overall academic self-concept

	First set of regressions		Second set of regressions	
	Predictor	**ΔR^2**	**Predictor**	**ΔR^2**
$Time_0$	Classroom Climate $_0$	0.4205		
	Home Environment $_0$	0.0685		
	Total R^2	*0.4890*		
$Time_1$	Classroom Climate $_1$	0.3462	Classroom Climate $_1$	0.3462
	Home Environment $_1$	0.0722	Home Environment $_1$	0.0722
	Total R^2	*0.4184*	*Total R^2*	*0.4184*
$Time_2$	Home Environment $_2$	0.2916	Home Environment $_2$	0.2916
	Classroom Climate $_2$	0.0697	Classroom Climate $_2$	0.0697
			Classroom Climate $_1$	0.0137
	Total R^2	*0.3613*	*Total R^2*	*0.3750*
$Time_3$	Home Environment $_3$	0.3444	Home Environment $_3$	0.3444
	Classroom Climate $_3$	0.0927	Classroom Climate $_3$	0.0927
	Total R^2	*0.4371*	*Total R^2*	*0.4371*

A closer examination of Table 4.5.5 revealed that between the present environmental scales, there was likewise a general shift in importance of predictors from the classroom climate scales to the home environment scales over the 3-year period. Specifically, the classroom climate scales were the major predictors of female students' overall academic self-concept at $time_0$ and $time_1$, while the home environment scales were the major predictors at $time_2$ and $time_3$.

The summary of the third and fourth sets of regressions is given in Table 4.5.6 on the following page. The results of the third set of regressions are also illustrated in Figures 4.5.5 and 4.5.6 on page 212.

Table 4.5.6: Regression based predictors of students' confidence and students' effort for female students

	Third set of regressions				Fourth set of regressions			
	Students' confidence		**Students' effort**		**Students' confidence**		**Students' effort**	
	Predictor	**ΔR^2**	**Predictor**	**ΔR^2**	**Predictor**	**ΔR^2**	**Predictor**	**ΔR^2**
Time $_0$	Relationship with Teachers $_0$	0.2298	Relationship with Teachers $_0$	0.3340				
	Academic Support $_0$	0.0651	Academic Support $_0$	0.0622				
	Peer Relationship $_0$	0.0335	Teachers' Expectations $_0$	0.0383				
	PSLE Result	0.0234						
Time $_1$	Peer Relationship $_1$	0.2171	Academic Support $_1$	0.2502	Peer Relationship $_1$	0.2171	Academic Support $_1$	0.2502
	Academic Support $_1$	0.0639	Teachers' Expectations $_1$	0.0966	Academic Support $_1$	0.0639	Teachers' Expectations $_1$	0.0966
	Teachers' Expectations $_1$	0.0255			Teachers' Expectations $_1$	0.0255		
Time $_2$	Academic Support $_2$	0.2136	Academic Support $_2$	0.2702	Academic Support $_2$	0.2136	Academic Support $_2$	0.2702
	Secondary 1 Class Position *	0.0510	Relationship with Teachers $_2$	0.0731	Secondary 1 Class Position *	0.0510	Relationship with Teachers $_2$	0.0731
	Relationship with Teachers $_2$	0.0254	Relationship with Parents $_2$	0.0302	Peer Relationship $_1$	0.0477	Relationship with Parents $_2$	0.0302
	Stream *	0.0229			Stream *	0.0230	Teachers' Expectations $_1$	0.0215
Time $_3$	Relationship with Teachers $_3$	0.2303	Relationship with Parents $_3$	0.3628	Relationship with Teachers $_3$	0.2303	Relationship with Parents $_3$	0.3628
	Secondary 2 Class Position *	0.0663	Teachers' Expectations $_3$	0.0650	Academic Support $_2$	0.0800	Teachers' Expectations $_3$	0.0650
	Academic Support $_3$	0.0479			Secondary 1 Class Position*	0.0405		

Note:
* negative β value

Figure 4.5.5: Regression based predictors of students' confidence for female students

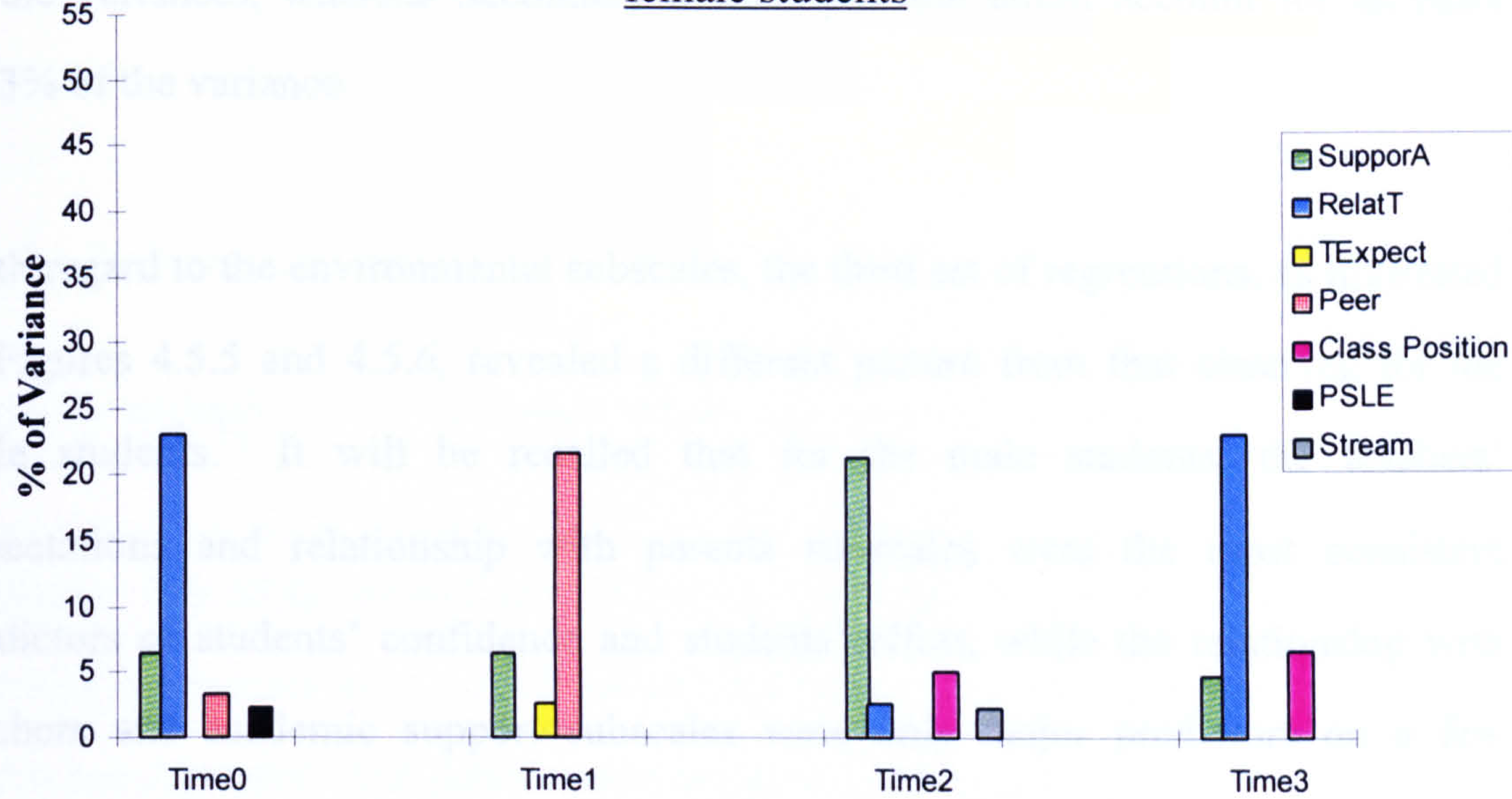
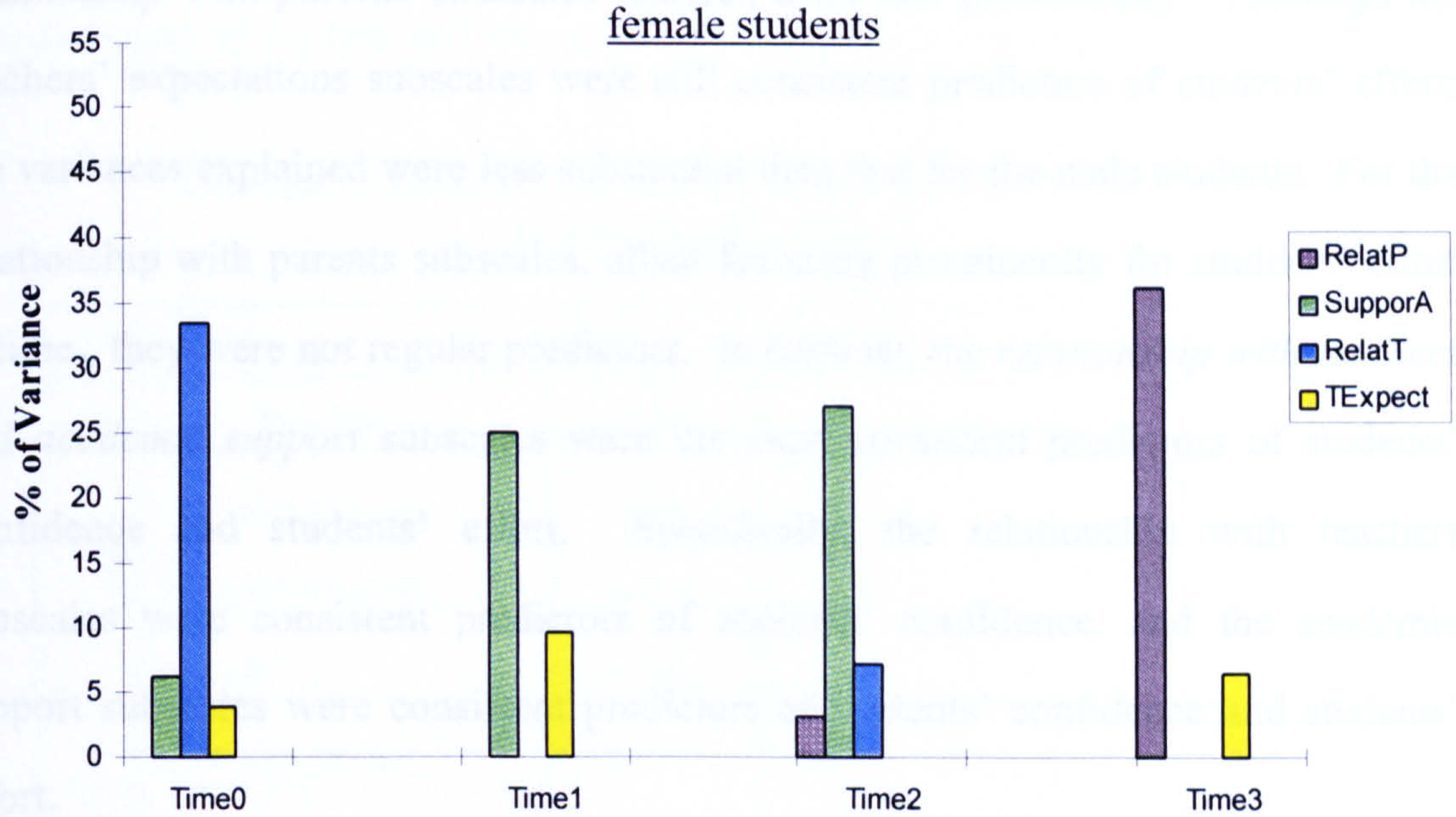


Figure 4.5.6: Regression based predictors of students' effort for female students



The results in Table 4.5.6 revealed that for the female students, PSLE result, stream and Secondary 1 and 2 class positions were significant non-environmental predictors of students' confidence. However, PSLE result was only able to explain an additional 2.34% of students' confidence at $time_0$, and stream was only able to explain an additional 2.29% to 2.30% of students' confidence at $time_2$. In contrast, Secondary 1 and 2 class positions were able to explain more substantial variances. Specifically, Secondary 1 class position could explain an additional 4.05% to 5.10%

of the variances, whereas Secondary 2 class position could account for an extra 6.63% of the variance.

With regard to the environmental subscales, the third set of regressions, as illustrated in Figures 4.5.5 and 4.5.6, revealed a different picture from that observed for the male students. It will be recalled that for the male students, the teachers' expectations and relationship with parents subscales were the most consistent predictors of students' confidence and students' effort, while the relationship with teachers and academic support subscales were only major predictors on a few occasions. For the female students, however, the *teachers' expectations* and *relationship with parents* subscales featured a lot less prominently. Although the teachers' expectations subscales were still consistent predictors of students' effort, the variances explained were less substantial than that for the male students. For the relationship with parents subscales, albeit featuring prominently for students' effort at $time_3$, they were not regular predictors. In contrast, the *relationship with teachers* and *academic support* subscales were the most consistent predictors of students' confidence and students' effort. Specifically, the relationship with teachers subscales were consistent predictors of students' confidence, and the academic support subscales were consistent predictors of students' confidence and students' effort.

The results of the fourth set of regressions, as shown on the right of Table 4.5.6, were not unlike that of the third set of regressions. However, the regressions revealed that a few of the past environmental subscales could explain rather substantial amount of variances in students' confidence and students' effort at a later stage of the study. Most notably, the academic support at $time_2$ could account for an additional 8.00% of students' confidence at $time_3$. The substantial contributions of past environmental subscales were not observed in the regression results of the male students. In fact, for the male students, the academic support subscale at $time_1$ could only explain an additional 2.61% of students' effort at $time_3$ (refer to Table 4.5.4).

4.5.3 Express and Normal Students

Stepwise multiple linear regression results of Express students

Similar to that of the overall sample and the male and female students, four sets of stepwise regressions were carried out on the Express students' academic self-concept scales and subscales. The detail results are given in Appendix 30.

The summary of the first and second sets of regressions is given in Table 4.5.7.

Table 4.5.7: Regression based predictors of Express students' overall academic self-concept

	First set of regressions		Second set of regressions	
	Predictor	**ΔR^2**	**Predictor**	**ΔR^2**
$Time_0$	Classroom Climate $_0$	0.3623		
	Home Environment $_0$	0.0864		
	Total R^2	*0.4487*		
$Time_1$	Classroom Climate $_1$	0.3770	Classroom Climate $_1$	0.3770
	Home Environment $_1$	0.0591	Home Environment $_1$	0.0591
			Home Environment $_0$	0.0081
	Total R^2	*0.4361*	***Total R^2***	*0.4442*
$Time_2$	Home Environment $_2$	0.2830	Home Environment $_2$	0.2830
	Classroom Climate $_2$	0.0738	Classroom Climate $_2$	0.0738
	Total R^2	*0.3568*	***Total R^2***	*0.3568*
$Time_3$	Home Environment $_3$	0.2945	Home Environment $_3$	0.2945
	Classroom Climate $_3$	0.0946	Classroom Climate $_3$	0.0946
			Home Environment $_2$	0.0110
	Total R^2	*0.3891*	***Total R^2***	*0.4001*

The first set of regressions, as shown on the left of Table 4.5.7, revealed that the present classroom climate and home environment scales were significant predictors of Express students' overall academic self-concept at all points in time during the study. They explained a total of 35.68% to 44.87% of the variances. The importance of the present environmental scales as predictors was substantiated in the second set of regressions, as shown on the right of Table 4.5.7. Although two of the past home environment scales were significant predictors of Express students' later overall academic self-concept, they only explained about an additional 1% of the variances.

A closer examination of Table 4.5.7 revealed that between the present environmental scales, there was likewise a general shift in importance of predictors from the classroom climate scales to the home environment scales over the 3-year period. Specifically, the classroom climate scales were the major predictors of Express students' overall academic self-concept at $time_0$ and $time_1$, while the home environment scales were the major predictors at $time_2$ and $time_3$.

The summary of the third and fourth sets of regressions is given in Table 4.5.8 on the following page. The results of the third set of regressions are also illustrated in Figures 4.5.7 and 4.5.8 on page 217.

Similar to that of the overall sample, the results in Table 4.5.8 established that for the Express students, most of the non-environmental variables were not significant predictors of students' confidence and students' effort. The only exceptions were gender and Secondary 1 and 2 class positions. Specifically, gender only accounted for an extra 1.84% of the variance in students' effort at $time_2$. In contrast, Secondary 1 and 2 class positions explained an additional 2.86% to 8.46% of the variances in student' confidence and students' effort.

Table 4.5.8: Regression based predictors of students' confidence and students' effort for Express students

	Third set of regressions				Fourth set of regressions			
	Students' confidence		Students' effort		Students' confidence		Students' effort	
	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2
$Time_0$	Academic $Support_0$	0.1823	Teachers' $Expectations_0$	0.2915				
	Peer $Relationship_0$	0.0578	Relationship with $Parents_0$	0.1083				
	Teachers' $Expectations_0$	0.0213	Peer $Relationship_0$	0.02$\bar{5}$4				
$Time_1$	Peer $Relationship_1$	0.2359	Teachers' $Expectations_1$	0.2790	Peer $Relationship_1$	0.2359	Teachers' $Expectations_1$	0.2790
	Teachers' $Expectations_1$	0.0670	Relationship with $Parents_1$	0.0949	Teachers' $Expectations_1$	0.0670	Relationship with $Parents_1$	0.0949
	Academic $Support_1$	0.0229			Academic $Support_1$	0.0229		
$Time_2$	Academic $Support_2$	0.2075	Academic $Support_2$	0.2588	Academic $Support_2$	0.2075	Academic $Support_2$	0.2588
	Secondary 1 Class Position *	0.0846	Teachers' $Expectations_2$	0.1016	Secondary 1 Class Position *	0.0846	Teachers' $Expectations_2$	0.1016
	Relationship with $Teachers_2$	0.0221	Secondary 1 Class Position *	0.0381	Relationship with $Teachers_2$	0.0221	Secondary 1 Class Position *	0.0381
			Gender	0.0184			Gender	0.0184
			Relationship with $Parents_2$	0.0202			Relationship with $Parents_2$	0.0202
$Time_3$	Relationship with $Teachers_3$	0.1725	Relationship with $Parents_3$	0.2781	Relationship with $Teachers_3$	0.1725	Relationship with $Parents_3$	0.2781
	Relationship with $Parents_3$	0.0763	Teachers' $Expectations_3$	0.0714	Relationship with $Parents_3$	0.0763	Teachers' $Expectations_3$	0.0714
	Secondary 2 Class Position *	0.0286			Secondary 2 Class Position *	0.0286		
					Academic $Support_3$	0.0223		

Note:
negative β value

Figure 4.5.7: Regression based predictors of students' confidence for Express students

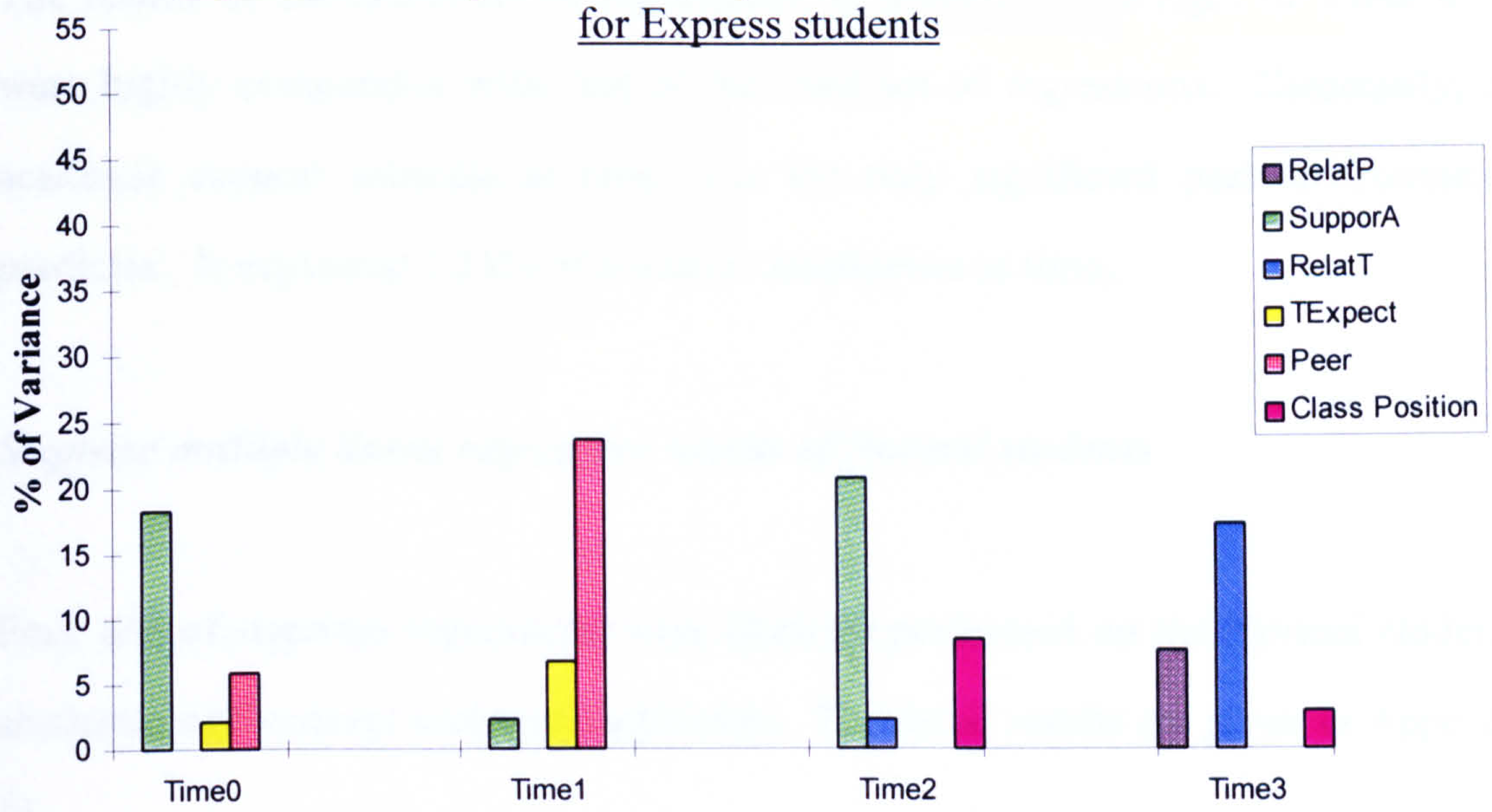
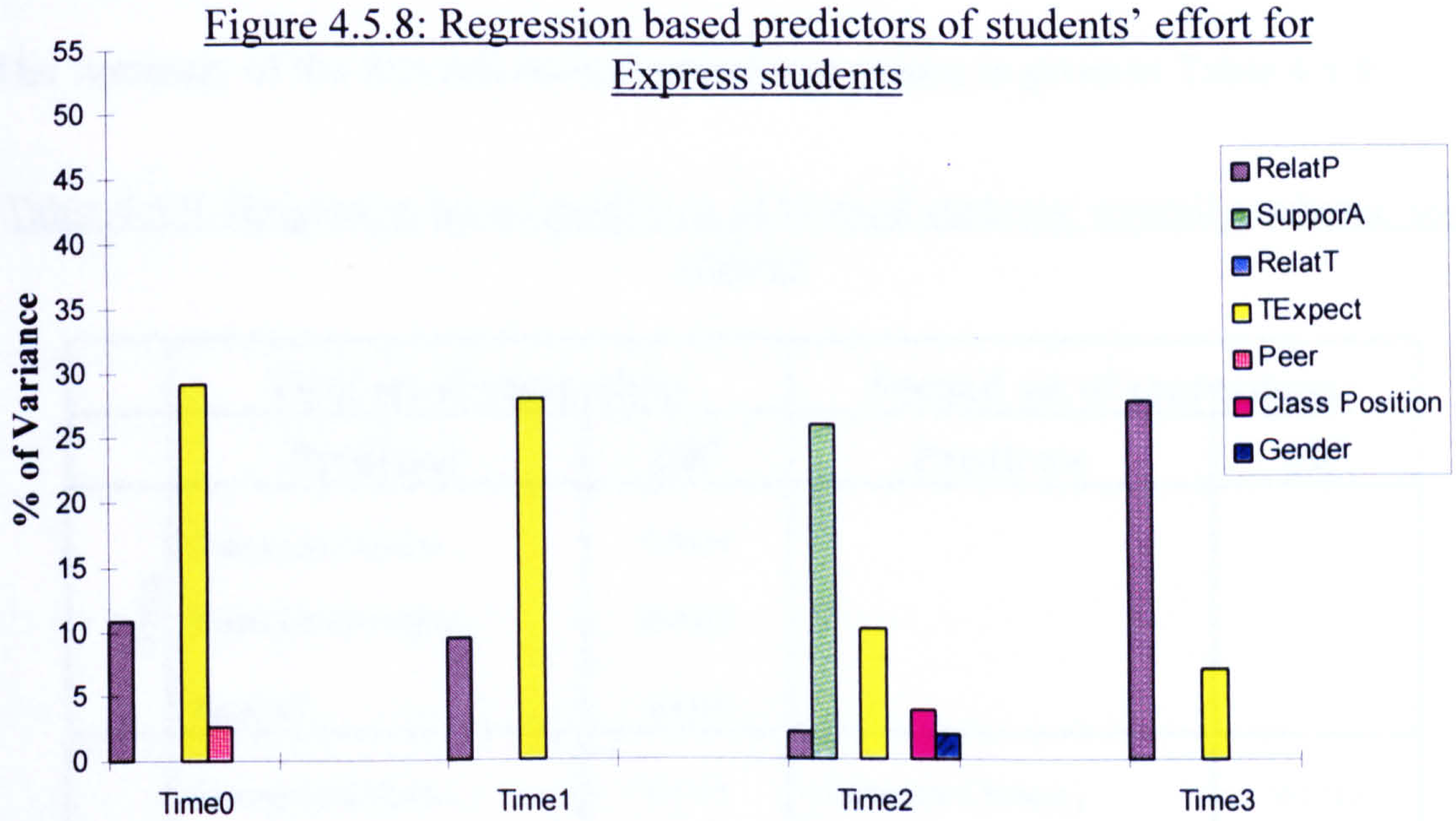


Figure 4.5.8: Regression based predictors of students' effort for Express students



With regard to the environmental subscales, the third set of regressions, as illustrated in Figures 4.5.7 and 4.5.8, revealed that for the Express students, the *academic support* subscales were consistent predictors of students' confidence throughout the 3-year period. The results also established that the *teachers' expectations* and *relationship with parents* subscales were consistent predictors of students' effort. It is noteworthy that for the overall sample, the academic support subscale was not a consistent predictor of students' confidence. In addition, the *relationship with teachers* subscale was a major predictor of students' effort at $time_0$.

The results of the fourth set of regressions, as shown on the right of Table 4.5.8, were highly comparable with that of the third set of regressions. Essentially, the academic support subscale at $time_2$ was the only significant past environmental predictor. It explained 2.23% of students' confidence at $time_3$.

Stepwise multiple linear regression results of Normal students

Four sets of stepwise regressions were likewise performed on the Normal students' academic self-concept scales and subscales. The detail results are given in Appendix 31.

The summary of the first and second sets of regressions is given in Table 4.5.9.

Table 4.5.9: Regression based predictors of Normal students' overall academic self-concept

	First set of regressions		Second set of regressions	
	Predictor	**ΔR^2**	**Predictor**	**ΔR^2**
$Time_0$	Classroom Climate $_0$	0.3659		
	Home Environment $_0$	0.0722		
	Total R^2	*0.4381*		
$Time_1$	Classroom Climate $_1$	0.3115	Classroom Climate $_1$	0.3115
	Home Environment $_1$	0.0993	Home Environment $_1$	0.0993
	Total R^2	*0.4108*	*Total R^2*	*0.4108*
$Time_2$	Classroom Climate $_2$	0.2351	Classroom Climate $_2$	0.2351
	Home Environment $_2$	0.0856	Home Environment $_2$	0.0856
			Classroom Climate $_1$	0.0398
	Total R^2	*0.3207*	*Total R^2*	*0.3605*
$Time_3$	Home Environment $_3$	0.3768	Home Environment $_3$	0.3768
	Classroom Climate $_3$	0.0727	Classroom Climate $_3$	0.0727
			Home Environment $_1$	0.0204
	Total R^2	*0.4495*	*Total R^2*	*0.4699*

The first set of regressions, as shown on the left of Table 4.5.9, revealed that the present classroom climate and home environment scales were significant predictors of Normal students' overall academic self-concept at all points in time during the study. They explained a total of 32.07% to 44.95% of the variances. The importance of the present environmental scales as predictors was substantiated in the second set of regressions, as shown on the right of Table 4.5.9. Although two of the past environmental scales were significant predictors of Normal students' later overall academic self-concept, they only explained an extra 2% to 4% of the variances.

A closer examination of Table 4.5.9 revealed that between the present environmental scales, there was likewise a general shift in importance of predictors from the classroom climate scales to the home environment scales over the 3-year period. Specifically, the classroom climate scales were the major predictors of Normal students' overall academic self-concept at $time_0$, $time_1$ and $time_2$, while the home environment scale was the major predictor at $time_3$.

The summary of the third and fourth sets of regressions is given in Table 4.5.10 on the following page. The results of the third set of regressions are also illustrated in Figures 4.5.9 and 4.5.10 on page 221.

The results in Table 4.5.10 established that for the Normal students, gender, PSLE result and Secondary 1 and 2 class positions were significant non-environmental predictors of students' confidence or students' effort. Specifically, gender was a consistent predictor of students' confidence. It explained an additional 2.15% to 5.57% of the variances. PSLE result, and Secondary 1 and 2 class positions were not consistent predictors. PSLE result explained an extra 2.56% of the variance, while Secondary 1 and 2 class positions accounted for an additional 2.20% to 5.48% of the variances.

Table 4.5.10: Regression based predictors of students' confidence and students' effort for Normal students

	Third set of regressions				Fourth set of regressions			
	Students' confidence		Students' effort		Students' confidence		Students' effort	
	Predictor	**ΔR^2**	**Predictor**	**ΔR^2**	**Predictor**	**ΔR^2**	**Predictor**	**ΔR^2**
Time $_0$	Teachers' Expectations $_0$	0.1915	Relationship with Teachers $_0$	0.2390				
	Relationship with Parents $_0$	0.0932	Relationship with Parents $_0$	0.0615				
	Peer Relationship $_0$	0.0366	Teachers' Expectations $_0$	0.0211				
	Gender *	0.0418						
Time $_1$	Teachers' Expectations $_1$	0.1957	Relationship with Parents $_1$	0.2230	Teachers' Expectations $_1$	0.1957	Relationship with Parents $_1$	0.2230
	Relationship with Parents $_1$	0.1018	Teachers' Expectations $_1$	0.0876	Relationship with Parents $_1$	0.1018	Teachers' Expectations $_1$	0.0876
			PSLE Result	0.0256			PSLE Result	0.0256
Time $_2$	Academic Support $_2$	0.1594	Teachers' Expectations $_2$	0.1687	Academic Support $_2$	0.1594	Teachers' Expectations $_2$	0.1687
	Teachers' Expectations $_2$	0.0546	Relationship with Parents $_2$	0.0657	Peer Relationship $_1$	0.0662	Relationship with Parents $_1$	0.0735
	Gender *	0.0429			Gender *	0.0557		
	Peer Relationship $_2$	0.0203			Teachers' Expectations $_2$	0.0248		
Time $_3$	Teachers' Expectations $_3$	0.2324	Relationship with Parents $_3$	0.3578	Teachers' Expectations $_3$	0.2324	Relationship with Parents $_3$	0.3578
	Relationship with Parents $_3$	0.0730	Secondary 2 Class Position *	0.0548	Relationship with Parents $_3$	0.0730	Secondary 2 Class Position *	0.0548
	Gender *	0.0215	Relationship with Teachers $_3$	0.0392	Academic Support $_0$	0.0251	Relationship with Teachers $_3$	0.0392
	Secondary 2 Class Position *	0.0342			Secondary 1 Class Position *	0.0220		
	Relationship with Teachers $_3$	0.0231			Gender *	0.0341		

Note:
negative β value

Figure 4.5.9: Regression based predictors of students' confidence for Normal students

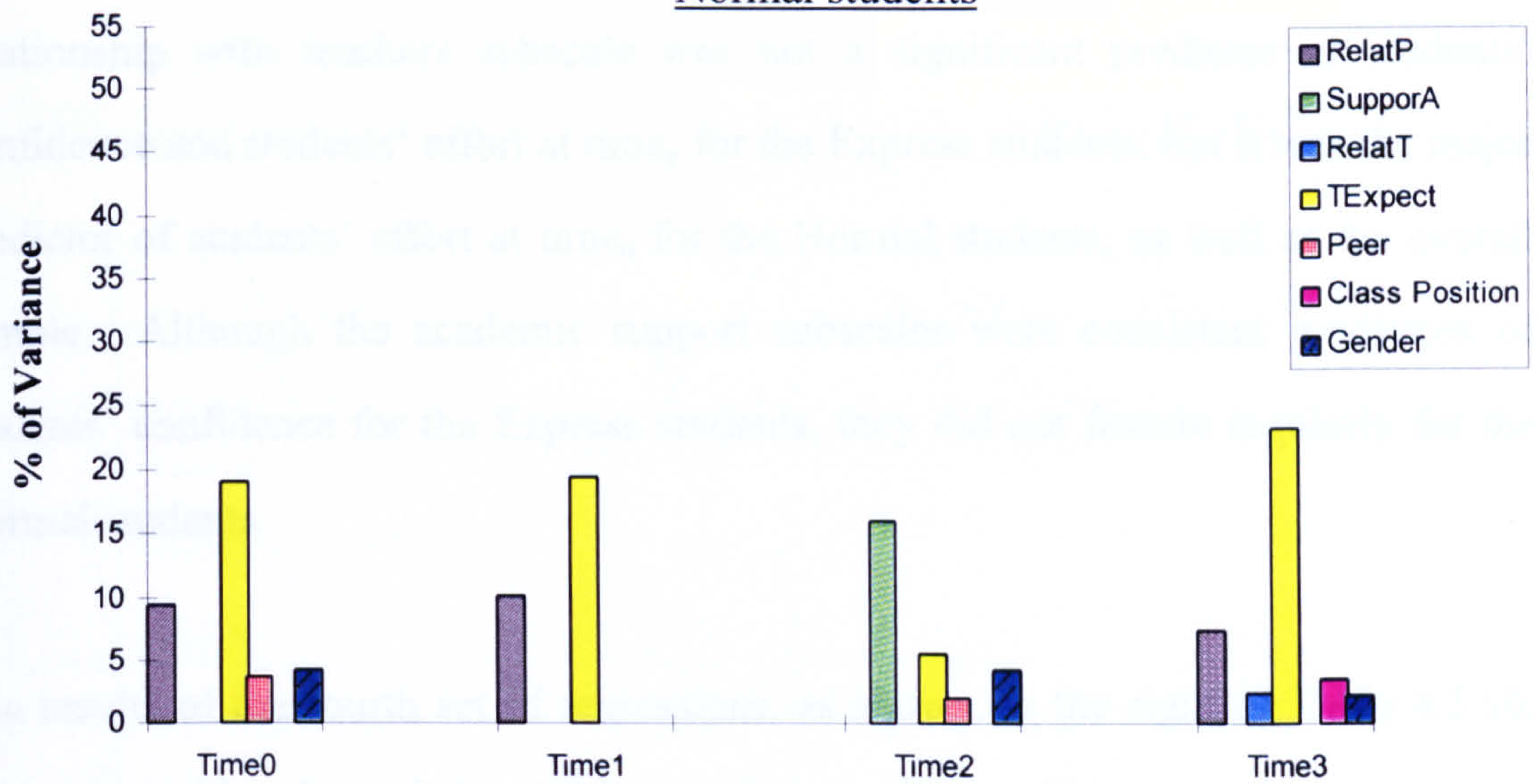
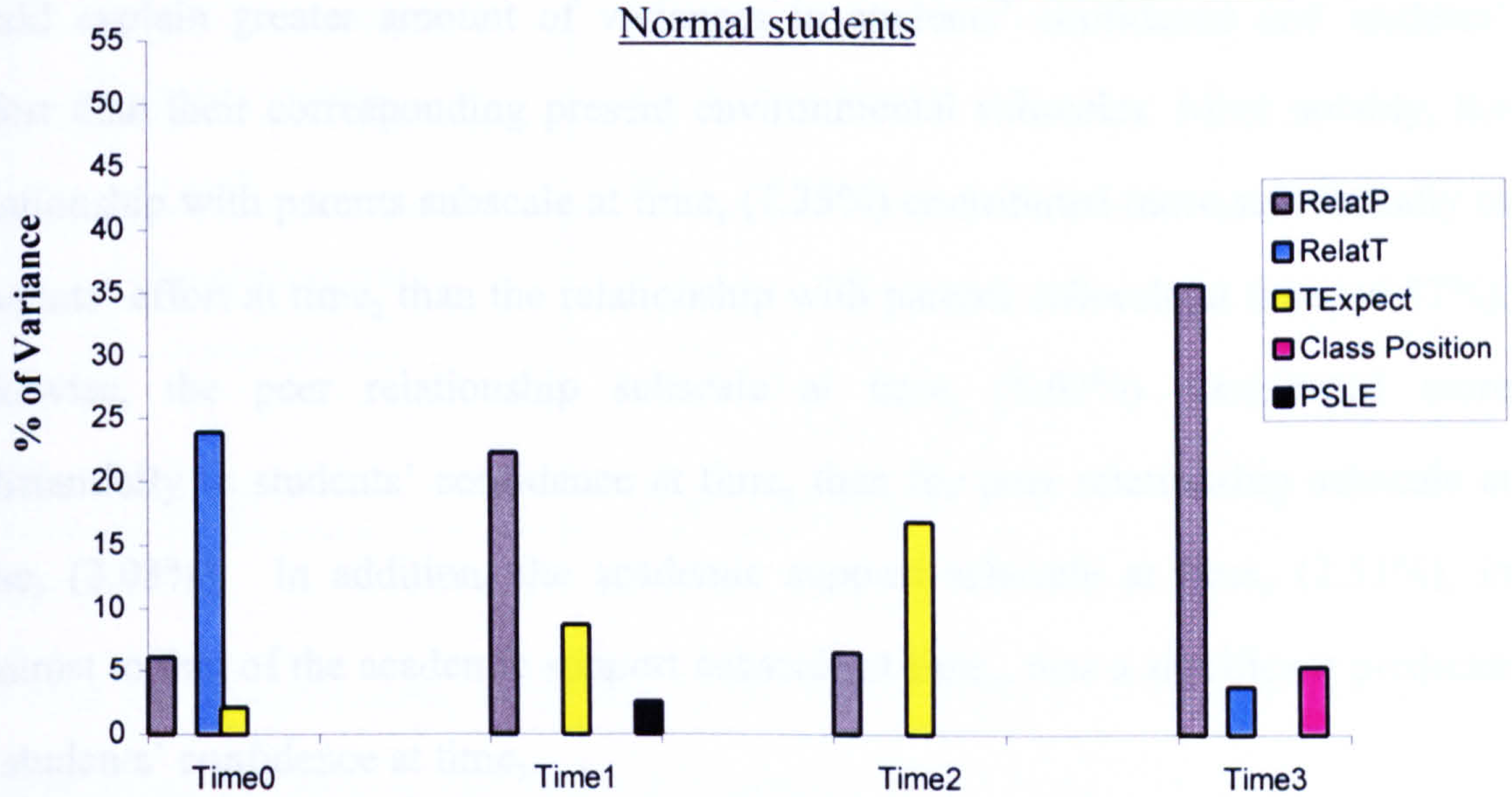


Figure 4.5.10: Regression based predictors of students' effort for Normal students



With regard to the environmental subscales, the third set of regressions, as illustrated in Figures 4.5.9 and 4.5.10, revealed that for the Normal students, the *teachers' expectations* and *relationship with parents* subscales were consistent predictors of students' confidence and students' effort. It will be recalled that both subscales were likewise consistent predictors of students' effort for the Express students. Nonetheless, the teachers' expectations subscales appeared to contribute more substantially to students' confidence of the Normal students than that of the Express students. In addition, there were also differences in terms of the contributions of the *relationship with teachers* and *academic support* subscales. Essentially, the relationship with teachers subscale was not a significant predictor of students' confidence and students' effort at $time_0$ for the Express students, but it was the major predictor of students' effort at $time_0$ for the Normal students, as well as the overall sample. Although the academic support subscales were consistent predictors of students' confidence for the Express students, they did not feature regularly for the Normal students.

The results of the fourth set of regressions, as shown on the right of Table 4.5.10, were not unlike that of the third set of regressions. However, the regressions revealed that for the Normal students, a few of the past environmental subscales could explain greater amount of variances in students' confidence and students' effort than their corresponding present environmental subscales. Most notably, the relationship with parents subscale at $time_1$ (7.35%) contributed more substantially to students' effort at $time_2$ than the relationship with parents subscale at $time_2$ (6.57%). Likewise, the peer relationship subscale at $time_1$ (6.62%) contributed more substantially to students' confidence at $time_2$ than the peer relationship subscale at $time_2$ (2.03%). In addition, the academic support subscale at $time_0$ (2.51%), in contrast to that of the academic support subscale at $time_3$, was a significant predictor of students' confidence at $time_3$.

4.5.4 Lower Express and Higher Normal Students

Stepwise multiple linear regression results of Lower Express students

Similar to that of the overall sample and the other subgroups of students, four sets of stepwise regressions were carried out on the Lower Express students' academic self-concept scales and subscales. The detail results are tabulated in Appendix 32.

The summary of the first and second sets of regressions is given in Table 4.5.11.

Table 4.5.11: Regression based predictors of Lower Express students' overall academic self-concept

	First set of regressions		Second set of regressions	
	Predictor	**ΔR^2**	**Predictor**	**ΔR^2**
$Time_0$	Home Environment $_0$	0.3378		
	Classroom Climate $_0$	0.0911		
	Total R^2	*0.4289*		
$Time_1$	Classroom Climate $_1$	0.4849	Classroom Climate $_1$	0.4849
	Home Environment $_1$	0.0737	Home Environment $_1$	0.0737
	Total R^2	*0.5586*	*Total R^2*	*0.5586*
$Time_2$	Home Environment $_2$	0.2716	Home Environment $_2$	0.2716
	Classroom Climate $_2$	0.0911	Classroom Climate $_2$	0.0911
	Total R^2	*0.3627*	*Total R^2*	*0.3627*
$Time_3$	Home Environment $_3$	0.3694	Home Environment $_2$	0.3885
	Classroom Climate $_3$	0.0586	Classroom Climate $_3$	0.0721
			Home Environment $_3$	0.0286
	Total R^2	*0.4280*	*Total R^2*	*0.4892*

The first set of regressions, as shown on the left of Table 4.5.11, revealed that the present classroom climate and home environment scales were significant predictors of Lower Express students' overall academic self-concept at all points in time during the study. They explained a total of 36.27% to 55.86% of the variances. The importance of the present environmental scales was largely substantiated in the second set of regressions, as shown on the right of Table 4.5.11, in that they still emerged as significant predictors when entered together with the past environmental scales. However, it is noteworthy that the home environment scale at $time_2$ was the major predictor of Lower Express students' overall academic self-concept at $time_3$.

A closer examination of Table 4.5.11 revealed that unlike the overall sample and the Express students, there appeared to be no general shift in importance of predictors from the classroom climate scales to the home environment scales over time. In this case, the home environment scales were the major predictors at $time_0$, $time_2$ and $time_3$, whilst the classroom climate scale was the major predictor at $time_1$.

The summary of the third and fourth sets of regressions is given in Table 4.5.12 on the following page. The results of the third set of regressions are also illustrated in Figures 4.5.11 and 4.5.12 on page 226.

The results in Table 4.5.12 established that for the Lower Express students, gender, socio-economic status, and Secondary 1 and 2 class positions were significant non-environmental predictors of students' confidence or students' effort. Gender explained an additional 3.41% of the variance in students' effort at $time_2$, and socio-economic status explained an additional 2.88% to 3.94% of the variances in students' confidence and students' effort at $time_3$. In contrast, Secondary 1 and 2 class positions had rather substantial contributions. They were able to explain an additional 7.93% to 10.14% of the variances in students' confidence.

For the environmental subscales, the third set of regressions, as illustrated in Figures 4.5.11 and 4.5.12, revealed that the consistent predictors for the Lower Express students were identical to that of the bigger group of Express students. Essentially, the *academic support* subscales were consistent predictors of students' confidence, while the *teachers' expectations* and *relationship with parents* subscales were consistent predictors of students' effort. Despite the similarities, the contributions of the academic support subscales appeared more substantial for the Lower Express students than for the Express students. In addition, the *relationship with teachers* subscale did not feature significantly for the Express students at $time_0$, but it was the major predictor of students' effort at $time_0$ for the Lower Express students.

Table 4.5.12: Regression based predictors of students' confidence and students' effort for Lower Express students

	Third set of regressions				Fourth set of regressions			
	Students' confidence		Students' effort		Students' confidence		Students' effort	
	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2
$Time_0$	Academic Support $_0$	0.2404	Relationship with Teachers $_0$	0.3099				
			Relationship with Parents $_0$	0.0689				
			Teachers' Expectations $_0$	0.0609				
$Time_1$	Academic Support $_1$	0.3156	Teachers' Expectations $_1$	0.4246	Academic Support $_1$	0.3156	Teachers' Expectations $_1$	0.4246
	Peer Relationship $_1$	0.0852	Relationship with Parents $_1$	0.1127	Peer Relationship $_1$	0.0852	Relationship with Parents $_1$	0.1127
$Time_2$	Academic Support $_2$	0.2459	Teachers' Expectations $_2$	0.3023	Academic Support $_2$	0.2459	Teachers' Expectations $_2$	0.3023
	Secondary 1 Class Position *	0.0793	Academic Support $_2$	0.1177	Secondary 1 Class Position *	0.0793	Academic Support $_2$	0.1177
	Relationship with Teachers $_2$	0.0358	Gender	0.0341	Relationship with Teachers $_2$	0.0358	Gender	0.0341
$Time_3$	Academic Support $_3$	0.2679	Relationship with Teachers $_3$	0.3217	Academic Support $_3$	0.2679	Academic Support $_2$	0.3309
	Secondary 2 Class Position *	0.1014	Relationship with Parents $_3$	0.0797	Secondary 2 Class Position *	0.1014	Relationship with Teachers $_3$	0.1052
	Relationship with Parents $_3$	0.0330	Socio-Economic Status	0.0320	Relationship with Parents $_2$	0.0579	Relationship with Parents $_3$	0.0337
	Socio-Economic Status	0.0394			Socio-Economic Status	0.0288		

Note:
negative β value

Figure 4.5.11: Regression based predictors of students' confidence for Lower Express students

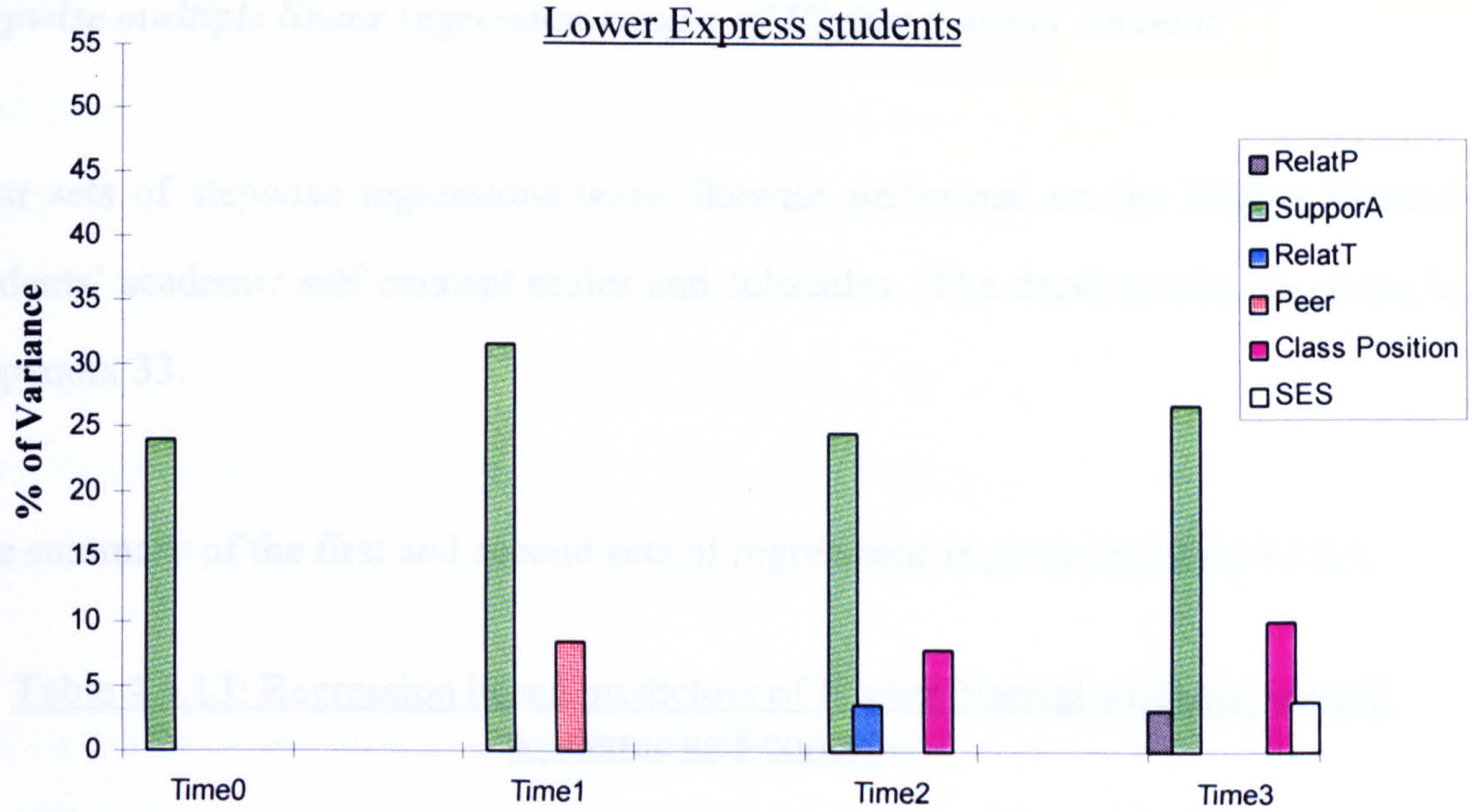
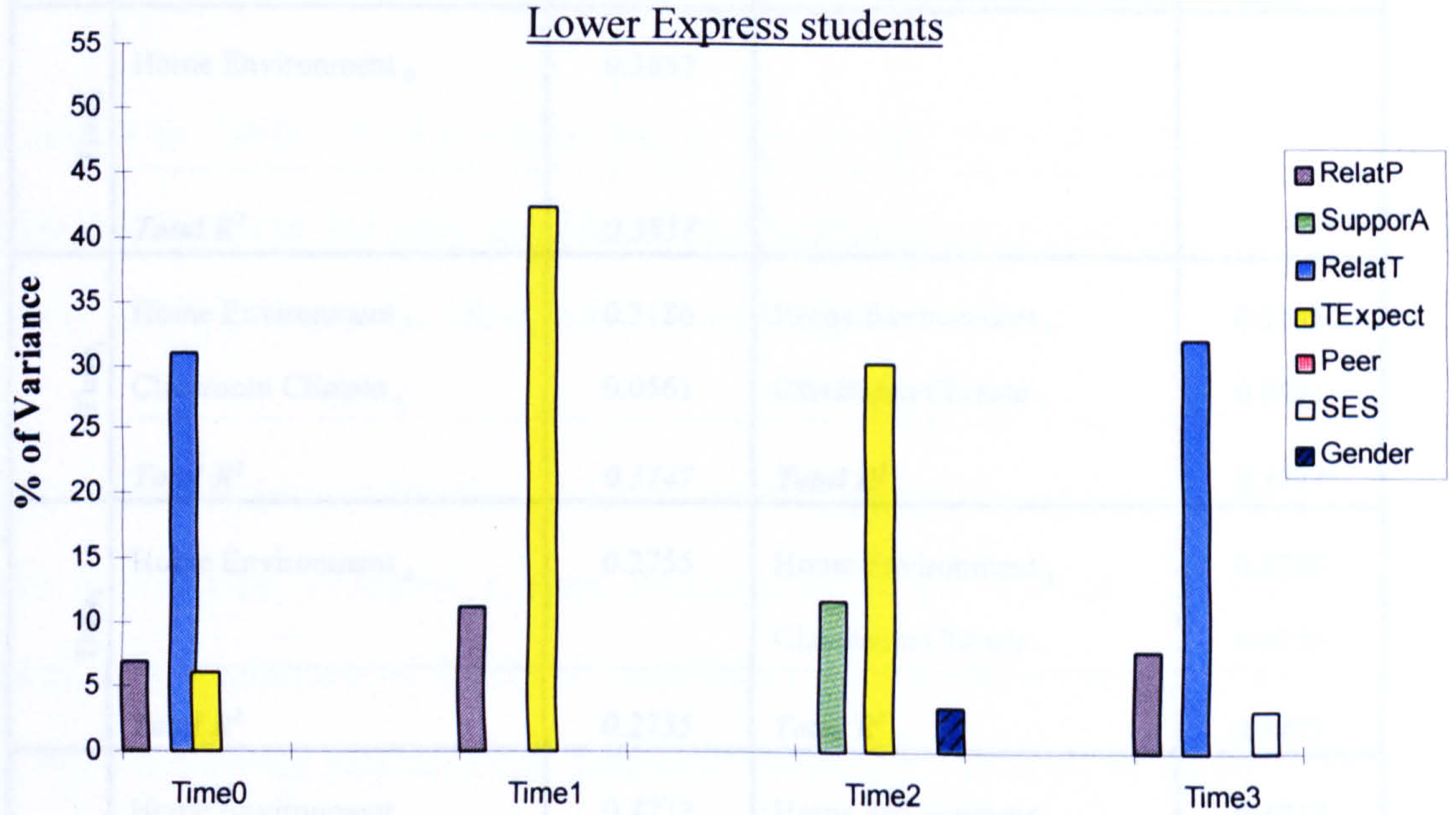


Figure 4.5.12: Regression based predictors of students' effort for Lower Express students



The results of the fourth set of regressions, as shown on the right of Table 4.5.12, were quite similar to that of the third set of regressions. However, the regressions revealed that for the Lower Express students, a few of the past environmental subscales could explain very substantial amount of variances in students' confidence and students' effort at a later stage of the study. Most notably, the academic support subscale at $time_2$ was the major predictor of students' effort at $time_3$, and it explained 33.09% of the variance. In addition, the relationship with parents subscale at $time_2$ accounted for an additional 5.79% of students' confidence at $time_3$.

Stepwise multiple linear regression results of Higher Normal students

Four sets of stepwise regressions were likewise performed on the Higher Normal students' academic self-concept scales and subscales. The detail results are given in Appendix 33.

The summary of the first and second sets of regressions is given in Table 4.5.13.

Table 4.5.13: Regression based predictors of Higher Normal students' overall academic self-concept

	First set of regressions		Second set of regressions	
	Predictor	**ΔR^2**	**Predictor**	**ΔR^2**
$Time_0$	Home Environment $_0$	0.3857		
	Total R^2	*0.3857*		
$Time_1$	Home Environment $_1$,	0.3186	Home Environment $_1$	0.3186
	Classroom Climate $_1$	0.0561	Classroom Climate $_1$	0.0561
	Total R^2	*0.3747*	***Total R^2***	*0.3747*
$Time_2$	Home Environment $_2$	0.2755	Home Environment $_2$	0.2755
			Classroom Climate $_0$	0.0720
	Total R^2	*0.2755*	***Total R^2***	*0.3475*
$Time_3$	Home Environment $_3$	0.4232	Home Environment $_3$	0.4232
			Home Environment $_0$	0.0394
	Total R^2	*0.4232*	***Total R^2***	*0.4626*

The first set of regressions, as shown on the left of Table 4.5.13, revealed that the present home environment scales were significant and major predictors of Higher Normal students' overall academic self-concept at all points in time throughout the study. In contrast, only one of the present classroom climate scales was a significant predictor. In total, the present environmental scales explained about 27.55% to

42.32% of the variances. The importance of the present home environment scales as predictors was substantiated in the second set of regressions, as shown on the right of Table 4.5.13, in that they still emerged as significant and major predictors when entered together with the past environmental scales. However, it is noteworthy that the classroom climate scale at $time_0$ (7.20%), and the home environment scale at $time_0$ (3.94%) were able to contribute quite substantially to the variances in Higher Normal students' overall academic self-concept at $time_2$ and $time_3$ respectively.

The summary of the third and fourth sets of regressions is given in Table 4.5.14 on the following page. The results of the third set of regressions are also illustrated in Figures 4.5.13 and 4.5.14 on page 230.

The results in Table 4.5.14 revealed that for the Higher Normal students, Secondary 2 class position was the only significant non-environmental predictor. It explained an extra 4.70% of students' effort subscale at $time_3$.

For the environmental subscales, the third set of regressions, as illustrated in Figures 4.5.13 and 4.5.14, revealed a clear dominance of the *relationship with parents* subscales as predictors of students' confidence and students' effort. Specifically, they were consistent predictors of students' confidence, as well as major predictors of students' confidence at $time_0$ and $time_2$, and students' effort at $time_1$ and $time_3$. It will be recalled that the subscales were also consistent predictors of students' effort for the Lower Express students. Nonetheless, the variances explained for the Lower Express students were less substantial. Unlike that of the Lower Express students, the *academic support* and *teachers' expectations* subscales were not consistent predictors of students' confidence and students' effort for the Higher Normal students, and the *relationship with teachers* subscale was not a predictor at $time_0$.

Table 4.5.14: Regression based predictors of students' confidence and students' effort for Higher Normal students

	Third set of regressions				Fourth set of regressions			
	Students' confidence		Students' effort		Students' confidence		Students' effort	
	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2	Predictor	ΔR^2
Time $_0$	Relationship with Parents $_0$	0.2003	Academic Support $_0$	0.2671				
	Teachers' Expectations $_0$	0.0781						
Time $_1$	Teachers' Expectations $_1$	0.2497	Relationship with Parents $_1$	0.2554	Teachers' Expectations $_1$	0.2497	Relationship with Parents $_1$	0.2554
	Relationship with Parents $_1$	0.1081	Teachers' Expectations $_1$	0.0736	Relationship with Parents $_1$	0.1081	Teachers' Expectations $_1$	0.0736
			Relationship with Teachers $_1$ *	0.0520			Relationship with Teachers $_1$ *	0.0520
Time $_2$	Relationship with Parents $_2$	0.2228	Academic Support $_2$	0.2029	Relationship with Parents $_2$	0.2228	Relationship with Parents $_0$	0.2110
	Peer Relationship $_2$	0.0733	Peer Relationship $_2$	0.0834	Peer Relationship $_2$	0.0733	Peer Relationship $_2$	0.0724
Time $_3$	Relationship with Teachers $_3$	0.1891	Relationship with Parents $_3$	0.5291	Relationship with Parents $_3$	0.1926	Relationship with Parents $_3$	0.5291
			Secondary 2 Class Position *	0.0470	Relationship with Teachers $_3$	0.1179	Secondary 2 Class Position *	0.0470
			Relationship with Teachers $_3$	0.0330			Relationship with Teachers $_3$	0.0330

Note:
negative β value

Figure 4.5.13: Regression based predictors of students' confidence for Higher Normal students

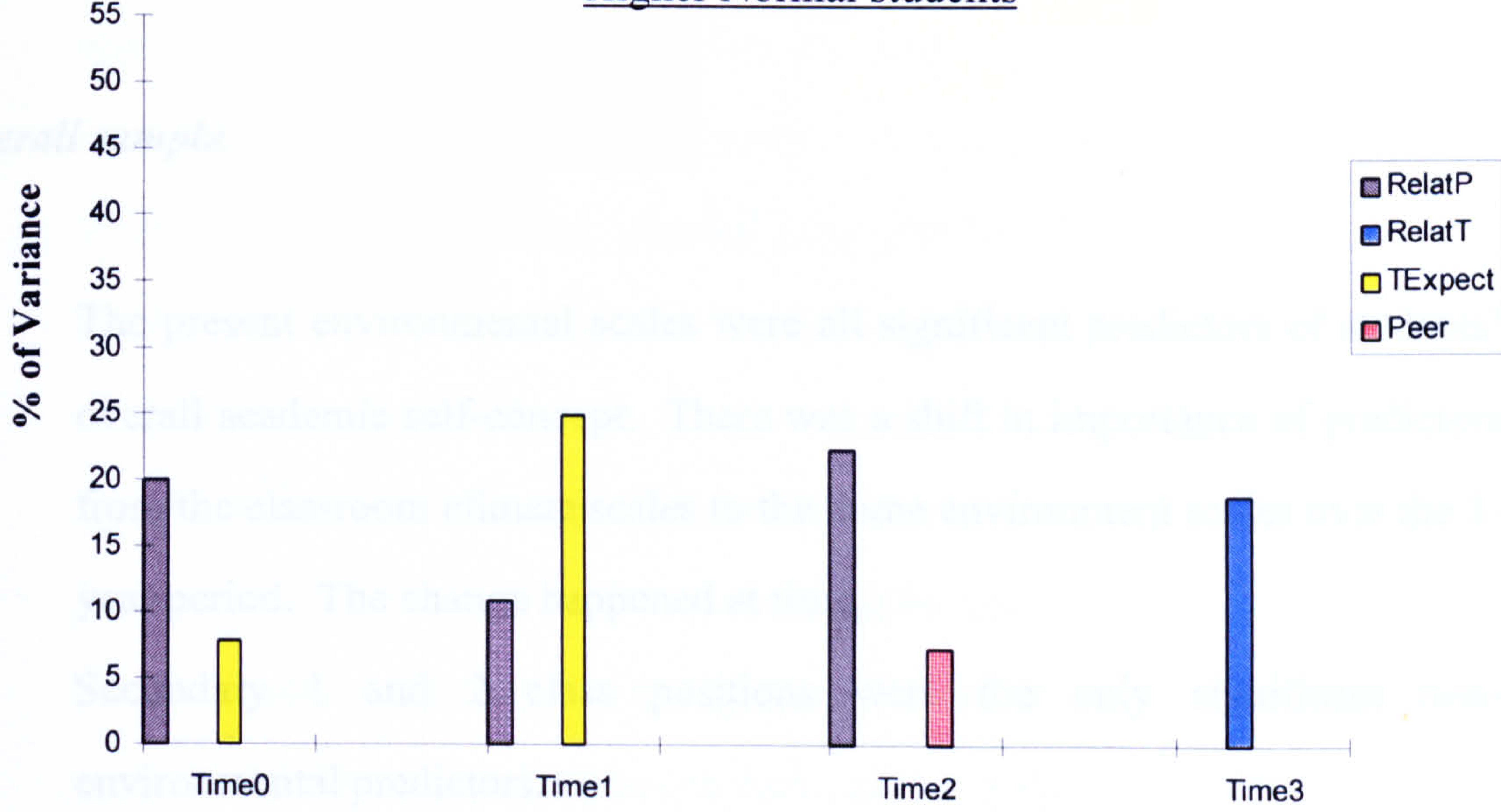
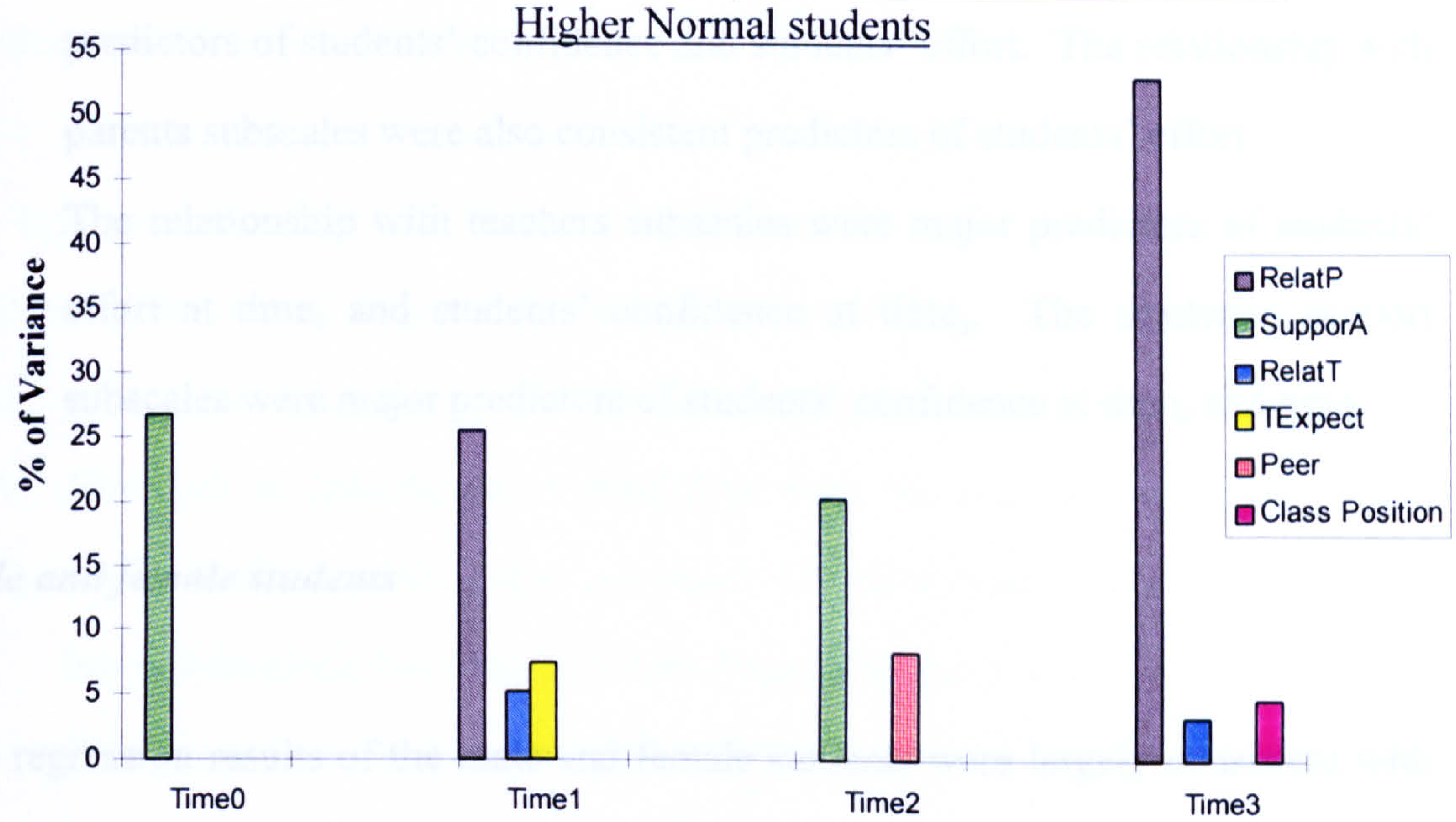


Figure 4.5.14: Regression based predictors of students' effort for Higher Normal students



The results of the fourth set of regressions, as shown on the right of Table 4.5.14, were similar to that of the third set of regressions. However, it is noteworthy that for the Higher Normal students, the relationship with parents subscale at time$_0$ had rather substantial contributions to students' confidence and students' effort in the later stage of the study. In particular, it was able to displace the relationship with teachers subscale at time$_3$ to become the major predictor of students' confidence at time$_3$. It was also able to replace the academic support subscale at time$_2$ to become the major predictor of students' effort at time$_2$.

4.5.5 Summary of Key Findings

Overall sample

(i) The present environmental scales were all significant predictors of students' overall academic self-concept. There was a shift in importance of predictors from the classroom climate scales to the home environment scales over the 3-year period. The change happened at time$_2$.

(ii) Secondary 1 and 2 class positions were the only significant non-environmental predictors.

(iii) The teachers' expectations subscales were consistent environmental predictors of students' confidence and students' effort. The relationship with parents subscales were also consistent predictors of students' effort.

(iv) The relationship with teachers subscales were major predictors of students' effort at time$_0$ and students' confidence at time$_3$. The academic support subscales were major predictors of students' confidence at time$_0$ and time$_2$.

Male and female students

The regression results of the male and female students were largely consistent with that of the overall sample. The notable differences in the results are:

(i) The shift in importance of predictors from the present classroom climate scales to the present home environment scales happened at time$_3$ for the male students, but at time$_2$ for the female students and the overall sample.

(ii) Although PSLE result and stream were not significant predictors of students' confidence or students' effort for the overall sample and male students, they were significant predictors for the female students. However, they only explained about an additional 2% of the variances.

(iii) There were differences between genders in the relative contributions of the environmental subscales on students' confidence and students' effort. Essentially, the teachers' expectations and relationship with parents subscales were more consistent and substantial predictors for the male students than for the female students. In contrast, the relationship with teachers and academic support subscales were more consistent and substantial predictors for the female students than for the male students.

(iv) In contrast to the results of the overall sample and the male students, for the female students, the academic support subscale at $time_2$ could explain an additional 8.00% of the variance in students' confidence at $time_3$.

Express and Normal students

The regression results of the Express and Normal students were largely consistent with that of the overall sample. The notable differences in the results are:

(i) The shift in importance of predictors from the present classroom climate scales to the present home environment scales happened at $time_3$ for the Normal students, but at $time_2$ for the Express students and the overall sample.

(ii) Secondary 1 and 2 class positions explained up to an additional 8.5% of the variances in students' academic self-concept (subscales) for the Express students, but only up to an extra 5.5% of the variances for Normal students.

(iii) Although PSLE result was not a significant predictor of students' confidence and students' effort for the overall sample and Express students, it was a significant predictor for the Normal students.

(iv) There were differences between the Express and Normal students in the relative contributions of the environmental subscales on students' confidence and students' effort. Essentially, the academic support subscales were more consistent predictors for the Express students than for the Normal students.

In contrast, although the teachers' expectations subscales were consistent predictors of students' effort for both the Express and Normal students, they had more substantial and consistent impact on students' confidence of the Normal students than that of the Express students. In addition, the relationship with teachers subscale was a major predictor of students' effort at $time_0$ for the overall sample and the Normal students, but it was not a significant predictor for the Express students.

(v) In contrast to that of the overall sample and the Express students, a number of the past environmental subscales, particularly, home environment subscales at $time_0$ and $time_1$, had rather substantial contributions to students' confidence and students' effort for the Normal students in the later stage of the study.

Lower Express and Higher Normal students

The regression results of the Lower Express and Higher Normal students were largely consistent with that of the overall sample. The notable differences in the results are:

(i) Unlike that of the overall sample, and the Express and Normal students, the present home environment scales were the major predictors of Lower Express students' overall academic self-concept on three out of four occasions. They were also the major predictors of Higher Normal students' overall academic self-concept on all four occasions.

(ii) In contrast to that of the overall sample and other subgroups of students, many of the classroom climate scales were not significant predictors of Higher Normal students' overall academic self-concept.

(iii) Secondary 1 and 2 class positions explained up to an additional 10% of the variances in students' academic self-concept (subscales) for the Lower

Express students, but only up to an extra 5% of the variances for the Higher Normal students.

(iv) Although socio-economic status and gender were not significant predictors of students' confidence and students' effort for the overall sample and Higher Normal students, they were significant predictors for the Lower Express students. They explained an additional 3% to 4% of the variances.

(v) There were differences between the Lower Express and Higher Normal students in the relative contributions of the environmental subscales on students' confidence and students' effort. Essentially, the academic support subscales were more consistent predictors for the Lower Express students than for the Higher Normal students. Although they were also consistent predictors for the Express students, the variances explained were less. In addition, the relationship with teachers subscale was not a significant predictor for the Higher Normal students or the Express students at $time_0$. Nonetheless, it was the major predictor of students' effort at $time_0$ for the Lower Express students and the overall sample. Although the relationship with parents subscales were consistent predictors of students' effort for the Lower Express students, they had an overwhelming dominance on Higher Normal students' academic self-concept. Specifically, for the Higher Normal students, the subscales were consistent predictors of students' confidence, as well as major predictors of students' confidence at $time_0$ and $time_2$, and students' effort subscales at $time_1$ and $time_3$.

(vi) The past environment scales and subscales contributed rather substantially to the Lower Express and Higher Normal students' later academic self-concept. Essentially, for the Lower Express students, the home environment scale and subscales at $time_2$ contributed more substantially to their later academic self-concept than that of the present environmental scale and subscales. For the Higher Normal students, the home environment scale and subscales at $time_0$

contributed more substantially to their later academic self-concept than that of the present environmental scale and subscales.

4.6 Additional Subgroups Comparisons

The analyses of Section 4.1 to 4.3 on developmental changes and subgroups comparisons of students' academic self-concept, and their perceptions of home environment and classroom climate focused on large groups of students. It is tenable that subtle changes of heterogeneous subgroups of students could have been masked in the use of averaged means of the overall sample, male and female students, and Express and Normal students (Hirsh & DuBois, 1991). In an attempt to have a clearer picture, additional subgroups comparisons were conducted on smaller, heterogeneous subgroups of students with (a) different academic abilities and aptitudes, and (b) different self-perceptions of academic self-concept, home environment and classroom climate. The first set of subgroups, namely, the ability bands of students, were identified with the use of students' PSLE results. The second set of subgroups, namely, clusters of students, were identified with the use of cluster analysis. The results of the two sets of subgroups are given in Sections 4.6.1 and 4.6.2 respectively.

4.6.1 Ability Bands of Students

The data analysis in this section was tailored to examine subgroup comparisons by ability bands of students' academic self-concept, and their perceptions of home environment and classroom climate at each point in time (see Section 2.8).

An overview

The students in the overall sample were divided into six ability bands based on the streaming criteria, that is, the PSLE results. They were the three Express ability bands, namely, the Higher Express, Middle Express and Lower Express students, and the three Normal ability bands, namely, the Higher Normal, Middle Normal and Lower Normal students (as defined in Section 2.9).

It will be recalled that the PSLE results of the six ability bands were significantly different when subjected to the Scheffe test (see Section 3.2.2, Table 3.2.3). Specifically, the Higher Express students had the best PSLE results, followed by the Middle Express, Lower Express, Higher Normal, Middle Normal, and finally Lower Normal students. In addition, many of the ability bands had significantly different non-verbal reasoning test scores (see Section 3.2.2, Table 3.2.5) and a number of them had significantly different Secondary 1 and 2 class positions (see Section 3.2.2, Table 3.2.7).

Subgroup comparisons

To ascertain whether there was any significant difference between the ability bands in terms of their academic self-concept, home environment and classroom climate, the scores of the measures were computed independently at $time_0$, $time_1$, $time_2$ and $time_3$ for the six subgroups, and subjected to the one-way ANOVA and Scheffe test. In all cases, the comparisons were carried out between the six ability bands, as well as the three Express ability bands and the three Normal ability bands. The results are given in Appendix 34 and illustrated in Figures 4.6.1 to 4.6.4.

Figure 4.6.1: Academic self-concept, home environment and classroom climate scores of the ability bands of students at $time_0$

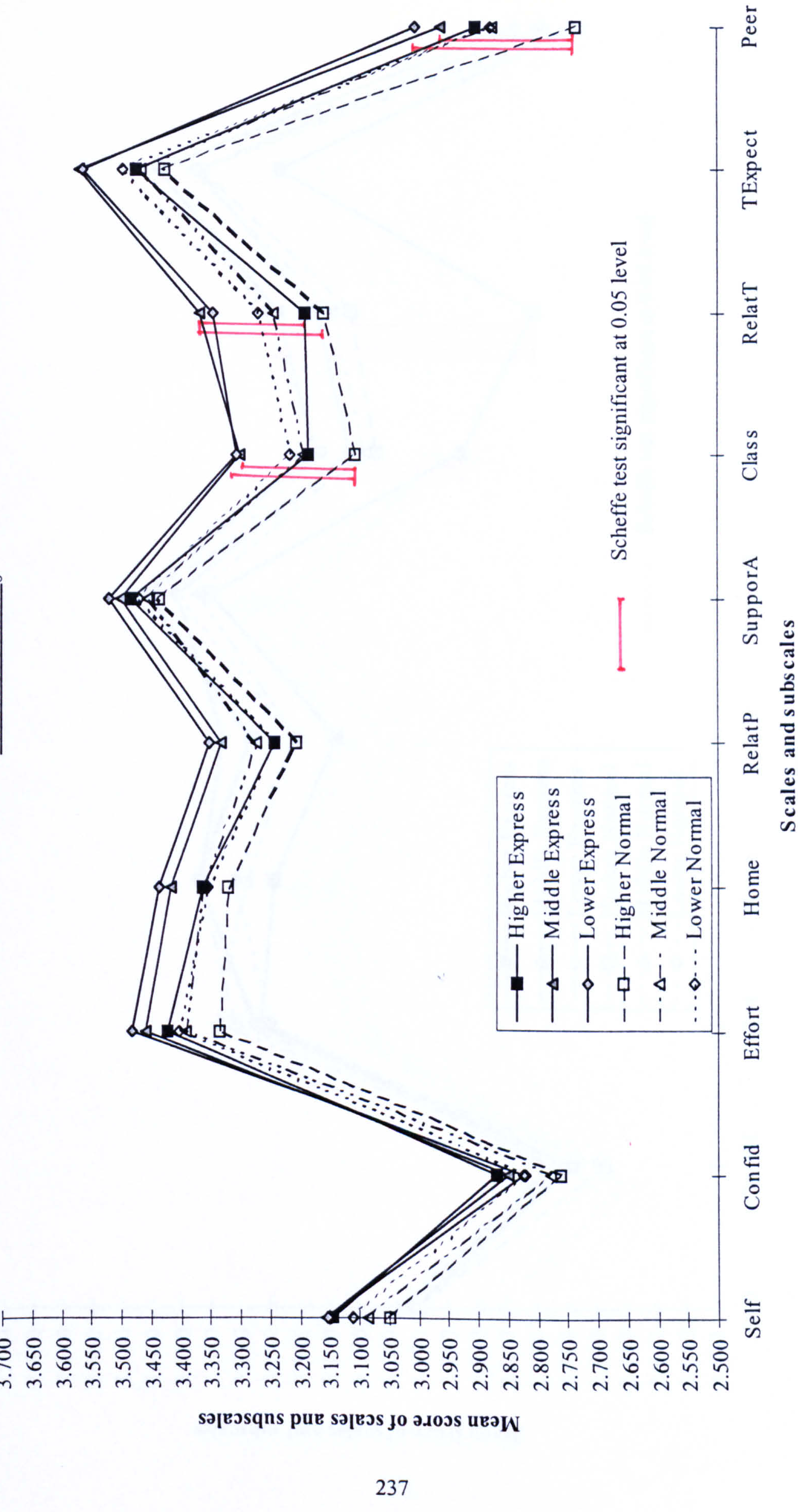


Figure 4.6.2: Academic self-concept, home environment and classroom climate scores of the ability bands of students at time$_1$

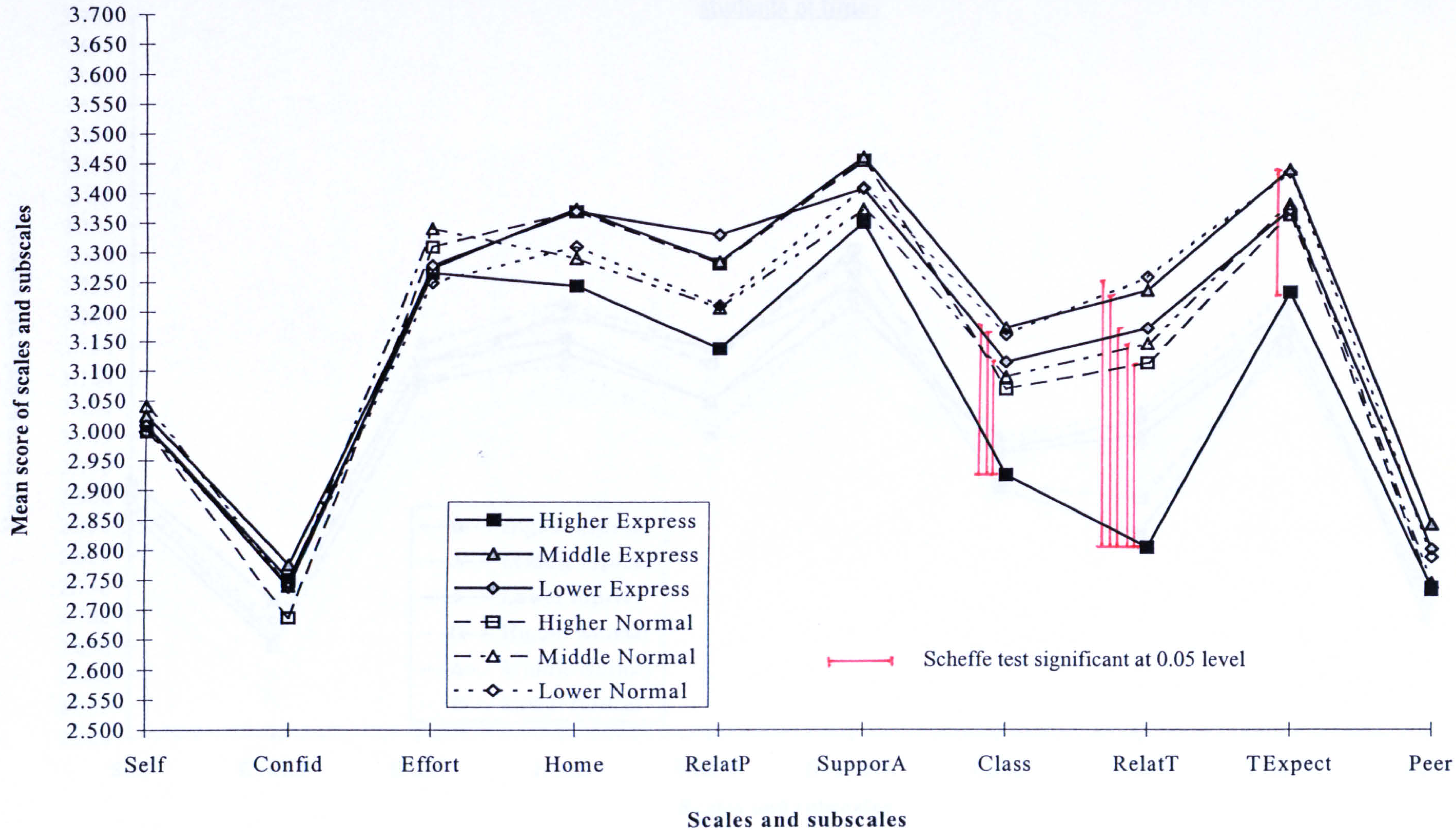


Figure 4.6.3: Academic self-concept, home environment and classroom climate scores of the ability bands of students at time$_2$

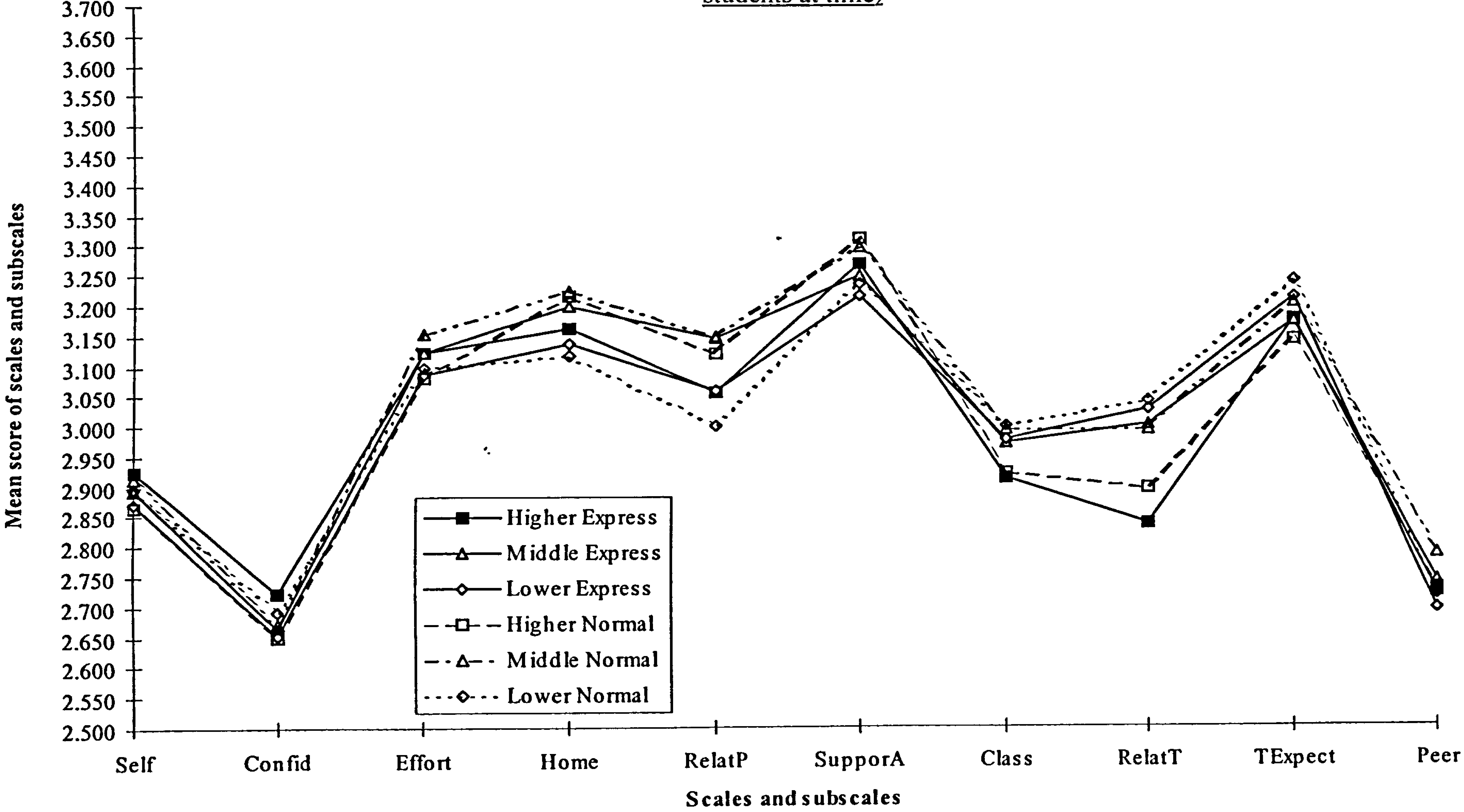
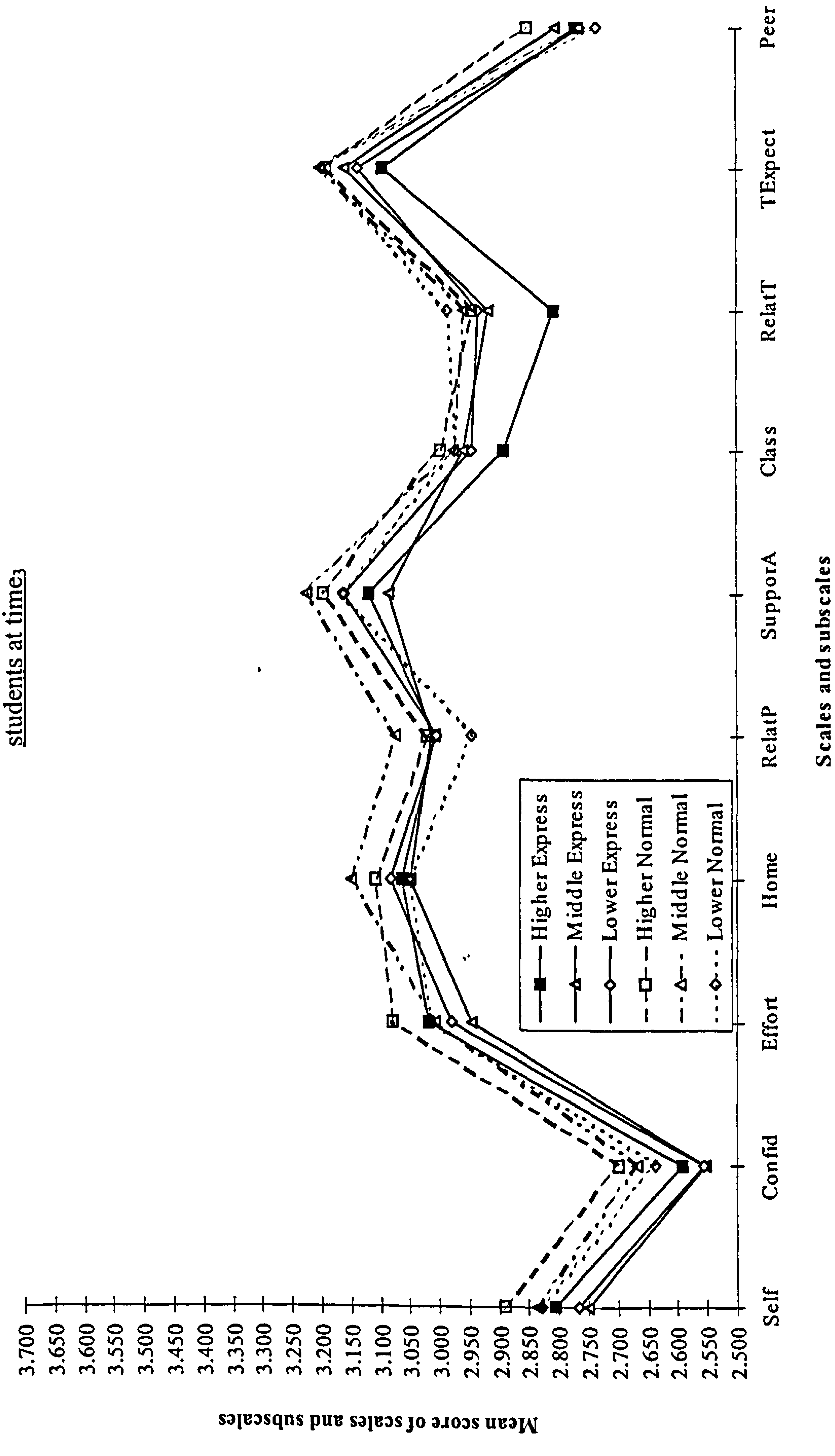


Figure 4.6.4: Academic self-concept, home environment and classroom climate scores of the ability bands of students at time$_3$



(I) Academic self-concept measures

From Figures 4.6.1 to 4.6.4, it appears that the six ability bands had highly comparable academic self-concept at all points in time during the 3-year period. The observation was substantiated when the one-way ANOVA revealed no significant difference in any of the academic self-concept scores between the six ability bands, the three Express ability bands, and the three Normal ability bands at any point in time. Despite the absence of significant subgroup effect, it is interesting to note that at $time_0$, the Higher Normal and Lower Express students had the lowest and highest academic self-concept scores respectively amongst the six ability bands. In contrast, at $time_3$, the Higher Normal students had the highest academic self-concept scores amongst the six ability bands, while those of the Lower Express students were amongst the lowest.

(II) Home environment measures

The results, as shown in Figures 4.6.1 to 4.6.4, also suggest that the six ability bands had similar perceptions of their home environment during the 3-year period. The observation was supported when the one-way ANOVA established only one significant subgroup effect on the scores of the relationship with parents subscale at $time_1$ ($p<0.05$). Specifically, the Scheffe test revealed that the Higher Express students had significantly lower score for the relationship with parents subscale than the Lower Express students when comparisons were made between the Express ability bands.

A closer analysis of the students' responses to the items of the relationship with parents subscale at $time_1$ (Appendix 35) revealed that the Higher Express students were more inclined than the Lower Express students to agree that *their parents did* *not understand them.* In addition, they were more disposed than the Middle Express and Lower Express students to agree that *their parents always scolded them.*

(III) Classroom climate measures

In contrast to the academic self-concept and home environment findings, the results, as shown in Figures 4.6.1 to 4.6.4, reveal large disparities between the ability bands in terms of their perceptions of classroom climate over the 3-year period. The differences between the subgroups were affirmed when the ANOVA established a number of significant subgroup effects on students' classroom climate scores at $time_0$, $time_1$ and $time_2$. The detail results are given below:

(a) Results at $time_0$

The ANOVA established significant differences between the six ability bands at $time_0$ in the scores of the classroom climate scale, relationship with teachers subscale and peer relationship subscale ($ps<0.001$). In view of the significant subgroup effects, the scores of the classroom climate measures were subjected to the Scheffe test. The key findings are as follows:

- The Higher Normal students had significantly lower scores for the classroom climate scale and peer relationship subscale than the Middle Express and Lower Express students ($ps<0.05$). They also had significantly lower score for the relationship with teachers subscale than the Middle Express students ($p<0.05$).

  The Scheffe test on students' responses to the items of the aforementioned classroom climate scale and subscales (Appendix 36) established that the Higher Normal students were more inclined than the Middle Express students to disagree that *their teachers tried to get to know them.* In addition, they were more disposed than the Lower Express students to agree that *there were groups of students who could not get along in their classes.*

- The Higher Express students had significantly lower score for the relationship with teachers subscale than the Middle Express students ($p<0.05$).

  The Scheffe test on students' responses to the items of the aforementioned subscale (Appendix 36) revealed that the Higher Express students were more inclined than the Middle Express and Lower Express students to agree that *their teachers did not trust them.* They were also more disposed than the Middle Express students to disagree that *their teachers praised them when they did a good piece of work.*

The disparities in the responses between the Higher Express students and the other ability bands were reiterated when comparisons were made between the three Express ability bands. In this case, the ANOVA established significant subgroup effects on the scores of the classroom climate scale ($p<0.01$) and the relationship with teachers subscale ($p<0.005$). When the scores of the classroom climate measures were subjected to the Scheffe test, the results revealed that

- The Higher Express students had significantly lower scores for the classroom climate scale and relationship with teachers subscale than the Middle Express and Lower Express students ($ps<0.05$).

  The Scheffe test on students' responses to the items of the aforementioned scale and subscale (Appendix 37) revealed that the Higher Express students were more inclined than the Middle Express and Lower Express students to agree that *their teachers did not trust them.* They were also more disposed than the Middle Express and Lower Express students to disagree that *their teachers often praised* *them when they did a good piece of work*, and *they found it easy to talk to their teachers about their problems*. In addition, they tended to disagree more than the Middle Express students that *their teachers tried to get to know them.*

(b) Results at $time_1$

The one-way ANOVA documented significant subgroup effects between the six ability bands on the scores of the classroom climate scale ($p<0.001$), relationship with teachers subscale ($p<0.001$) and teachers' expectations subscale ($p<0.01$). In view of the significant subgroup effects, the scores of the classroom climate measures were subjected to the Scheffe test. The key findings are as follows:

- The Higher Express students had significantly lower score for the relationship with teachers subscale than students in the other ability bands ($ps<0.05$). They also had significantly lower score for the classroom climate scale than the Middle Express, Lower Express and Lower Normal students ($ps<0.05$). In addition, they had significantly lower score for the teachers' expectations subscale than the Middle Express students ($p<0.05$).

The Scheffe test on students' responses to the items of the aforementioned measures (Appendix 38) revealed that the Higher Express students were more inclined than other students to disagree that *their teachers gave extra lessons to the weaker students*, and *their teachers enjoyed mixing with them at school functions*. They were more disposed than the Lower Normal students to disagree that *their teachers tried to get to know them.* Moreover, they were more likely than the Middle Express and Lower Normal students to disagree that *they found it easy to talk to their teachers about their problems.*

The Scheffe test on students' responses (Appendix 38) also revealed that the Higher Express students were more inclined than the Middle Normal and Lower Normal students to disagree that *their teachers were confident they could get good results*. In addition, they were more disposed than the Middle Express, Higher Normal and Lower Normal students to disagree that *their teachers made sure they worked hard for their exams*.

The disparities in the responses between the Higher Express students and the other ability bands were reiterated when comparisons were made between the three Express ability bands. In this case, the ANOVA established significant subgroup effects on the scores of the classroom climate scale ($p<0.001$), relationship with teachers subscale ($p<0.001$) and teachers' expectations subscale ($p<0.005$). When the scores of the classroom climate measures were subjected to the Scheffe test, the results revealed that:

- The Higher Express students had significantly lower scores for the classroom climate scale, relationship with teachers subscale and teachers' expectations subscale than the Middle Express and Lower Express students ($ps<0.05$).

The Scheffe test on students' responses to the items of the aforementioned measures (Appendix 39) revealed that the Higher Express students were more inclined than the other Express students to disagree that *their teachers gave extra lessons to the weaker students*, and *their teachers enjoyed mixing with them at school functions*. They tended to agree more than the other Express students that *their teachers spend very little time talking to them*. In addition, they were more disposed than the Middle Express students to disagree that *their teachers tried to get to know them*, and *they found it easy to talk to their teachers about their problems*. Moreover, they tended to agree more than the Middle Express students that *their teachers were only interested in the clever students in the class,* and *their teachers embarrassed them for not knowing the right answers.*

The Scheffe test on students' responses (Appendix 39) also established that the Higher Express students were more inclined than the Middle Express students to disagree that *their teachers were confident they could get good results, their teachers made sure they worked hard for their exams,* and *their teachers encouraged those who failed to work harder.* They were also more disposed than the other Express students to agree that *their teachers believed their class was weaker than other classes.*

(c) Results at $time_2$

The ANOVA established a significant subgroup effect ($p<0.01$) on the scores of the relationship with teachers subscale when comparisons were made between the six ability bands. However, the Scheffe test failed to identify any significant difference between any two ability bands in the scores of the subscale, so the subgroup effect was dismissed as a type I error. Although the ANOVA also found a significant subgroup effect ($p<0.05$) on the scores of the relationship with teachers subscale when comparisons were made between the Express ability bands, in this case, the Scheffe test established that

- The Higher Express students had significantly lower score for the relationship with teachers subscale than the Middle Express and Lower Express students ($ps<0.05$).

The Scheffe test on students' responses to the items of the aforementioned subscale (Appendix 40) revealed that the Higher Express students were more inclined than the other Express students to disagree that *their teachers gave extra* *lessons to the weaker students.* They were also more disposed than the Middle Express students to agree that *their teachers were only interested in the clever students in the class.*

Summary of key findings

To summarise, the ability bands had highly comparable academic self-concept over the 3-year period. They also had largely similar perceptions of their home environment. The congruency was only disrupted at $time_1$, when the Scheffe test on the Express ability bands revealed that the Higher Express students had significantly lower score for the relationship with parents subscale than the Lower Express students. In contrast, the ability bands had very different perceptions of their classroom climate at different points in time. The differences between the ability bands are summarised as follows:

(a) The Higher Normal students had significantly lower scores for the classroom climate scale and peer relationship subscale at $time_0$ than the Middle Express and Lower Express students. They also had significantly lower score for the relationship with teachers subscale at $time_0$ than the Middle Express students.

(b) The Higher Express students had significantly lower scores for the classroom climate scales, relationship with teachers subscales and teachers' expectations subscales at $time_0$, $time_1$ and $time_2$ than several other ability bands of students.

Clearly, the study of the ability bands has added further insights into our understanding of students in Singapore in terms of their academic self-concept and their perceptions of home environment and classroom climate. Amongst them, one of the most poignant findings, which was obscured in the study of bigger groups of

Express and Normal students, was that Higher Express students had such negative perception of their classroom climate as compared to other students.

4.6.2 Clusters of Students

The data analysis in this section was tailored to answer three broad categories of research questions pertaining to the different clusters of students in terms of their academic self-concept, and their perceptions of home environment and classroom climate. They were developmental changes of the clusters over time, subgroup comparisons by cluster at each point in time, and subgroup comparisons by cluster of developmental changes over time (see Section 2.8).

An overview

The students in the overall sample were divided into four clusters based on the scores of their academic self-concept, home environment and classroom climate measures with the help of the centroid relocation method (see Appendix 16).

To have a clear idea of the possible research significance of the cluster analysis, the clusters were characterised in terms of variables such as stream, gender and socio-economic status (Table 4.6.1), as well as PSLE result, Secondary 1 and 2 class positions, and non-verbal reasoning test score (Table 4.6.2). In an attempt to determine whether there was any significant difference between clusters in the aforementioned variables, the means of the clusters were subjected to the one-way ANOVA and the Scheffe test.

Table 4.6.1: Characteristics of the clusters based on stream, gender and socio-economic status

Variables	Subgroups	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Stream	Express	73.7%	53.2%	52.3%	47.7%
	Normal	26.3%	46.8%	47.7%	52.3%
	Mean	*1.26*	*1.47*	*1.48*	*1.52*
Gender	Male	47.4%	53.2%	54.9%	50.5%
	Female	52.6%	46.8%	45.1%	49.5%
	Mean	*1.53*	*1.47*	*1.45*	*1.50*
Socio-economic status	Unskilled	10.8%	5.4%	6.6%	13.1%
	Semi-skilled	46.1%	48.4%	54.3%	44.9%
	Skilled	27.7%	31.2%	22.5%	25.2%
	Managerial/Professional	15.4%	15.0%	16.6%	16.8%
	Mean	*2.48*	*2.56*	*2.49*	*2.46*

Table 4.6.2: Characteristics of the clusters based on PSLE results, non-verbal reasoning test scores and Secondary 1 and 2 class positions

Variables	Subgroups	Cluster 1	Cluster 2	Cluster 3	Cluster 4
PSLE Results	Higher Express (33.3%)	19.7%	21.5%	21.6%	11.9%
	Middle Express (33.3%)	32.6%	17.2%	11.5%	16.5%
	Lower Express (33.3%)	22.0%	15.1%	18.2%	18.3%
	Higher Normal (33.3%)	7.6%	13.3%	18.2%	15.6%
	Middle Normal (33.3%)	9.1%	16.1%	21.1%	21.1%
	Lower Normal (33.3%)	9.1%	17.2%	16.5%	16.5%
	Mean	*204.90*	*197.30*	*197.32*	*193.40*
Non-verbal reasoning test	Top 25 %	28.7%	19.1%	32.5%	18.9%
	Second 25%	25.0%	26.6%	21.2%	27.9%
	Third 25%	23.5%	22.3%	26.5%	24.3%
	Last 25%	22.8%	31.9%	19.9%	28.8%
	Mean	*23.10*	*21.91*	*23.19*	*22.50*
Secondary 1 class position	Position 1-10	24.1%	28.7%	29.4%	36.9%
	Position 11-20	26.3%	22.3%	28.8%	37.8%
	Position 21-30	33.6%	28.7%	25.5%	19.8%
	Position 31-45	16.1%	20.2%	16.3%	5.4%
	Mean	*19.42*	*19.82*	*18.21*	*14.42*
Secondary 2 class position	Position 1-10	26.3%	28.7%	32.7%	38.7%
	Position 11-20	30.7%	26.6%	32.0%	36.9%
	Position 21-30	27.7%	26.6%	28.8%	18.9%
	Position 31-45	15.3%	18.1%	6.5%	5.4%
	Mean	*18.58*	*18.64*	*16.36*	*13.91*

For the variables in Table 4.6.1, the one-way ANOVA failed to establish any cluster effect on gender and socio-economic status, but it established a cluster effect at 0.01

level on stream. A detail analysis via the Scheffe test revealed that cluster 1 had significantly more Express students than clusters 2, 3 and 4 ($ps<0.05$).

For the variables in Table 4.6.2, the one-way ANOVA failed to establish any significant cluster effect on PSLE results. However, it identified significant cluster effects on Secondary 1 and 2 class positions ($ps<0.01$). Specifically, the Scheffe test revealed that cluster 4 had significantly better average Secondary 1 class position than the other clusters, and better average Secondary 2 class position than clusters 1 and 2 ($ps<0.05$).

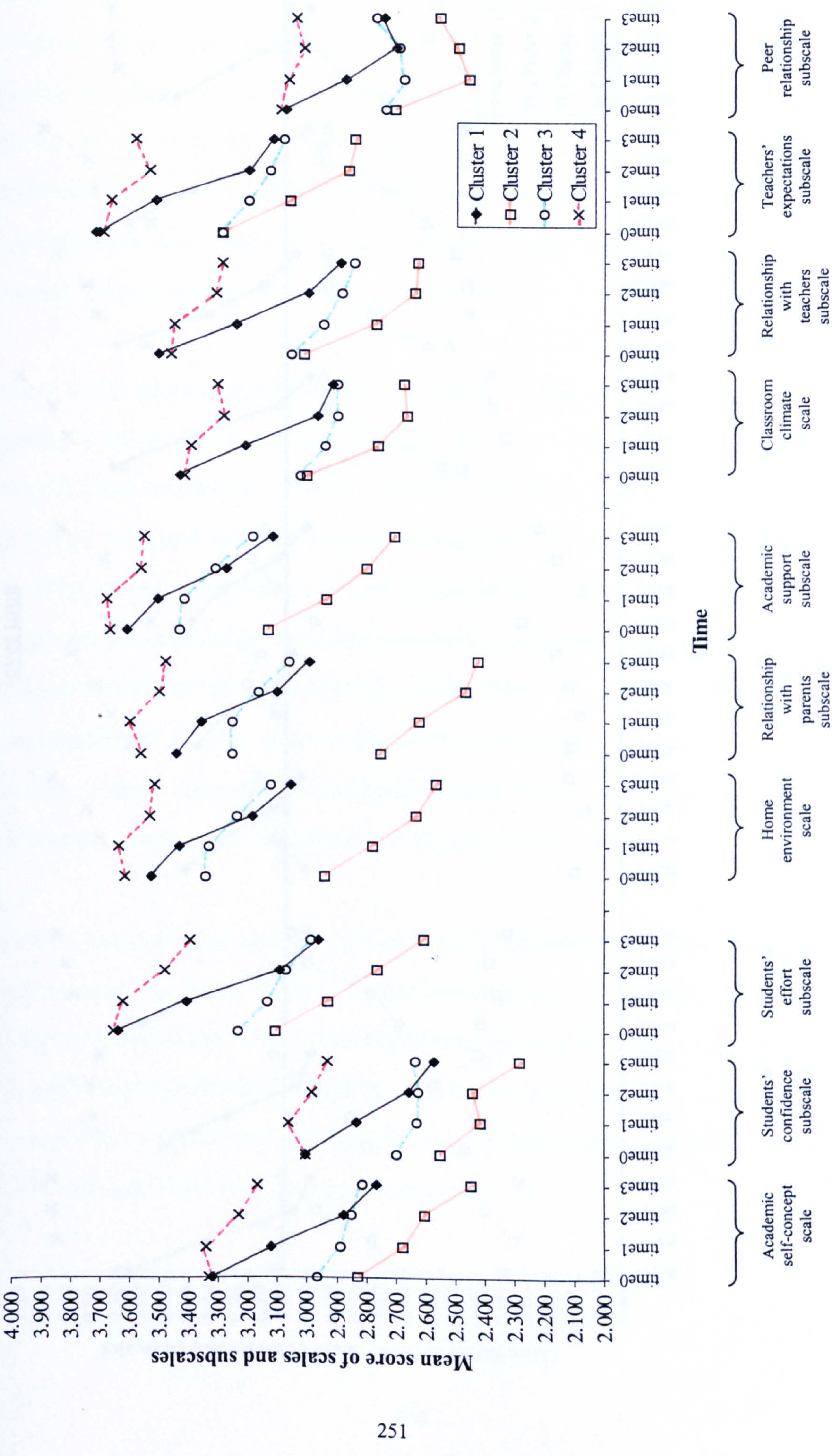
Developmental patterns over time

In order to examine the developmental patterns of the clusters over time, the means and standardised means of the clusters at $time_0$, $time_1$, $time_2$ and $time_3$ were rearranged from Appendix 16 and illustrated in Figures 4.6.5 and 4.6.6 respectively.

From Figure 4.6.5, it is apparent that most of the means of the clusters decreased over time. The developmental declines appeared most pronounced for cluster 1, followed by cluster 2. In comparison, the declines of clusters 3 and 4 were less substantial.

The results, as shown in Figure 4.6.6, revealed that the standardised means of cluster 2's home environment measures were lower than that of their classroom climate measures. In addition, the standardised means of cluster 3's classroom climate measures were lower than that of their home environment measures. The results suggest that students in cluster 2 had less favourable perception of their home environment than that of their classroom climate. In comparison, students in cluster 3 had less favourable perception of their classroom climate than that of their home environment.

Figure 4.6.5: Academic self-concept, home environment and classroom climate mean scores of the clusters over time



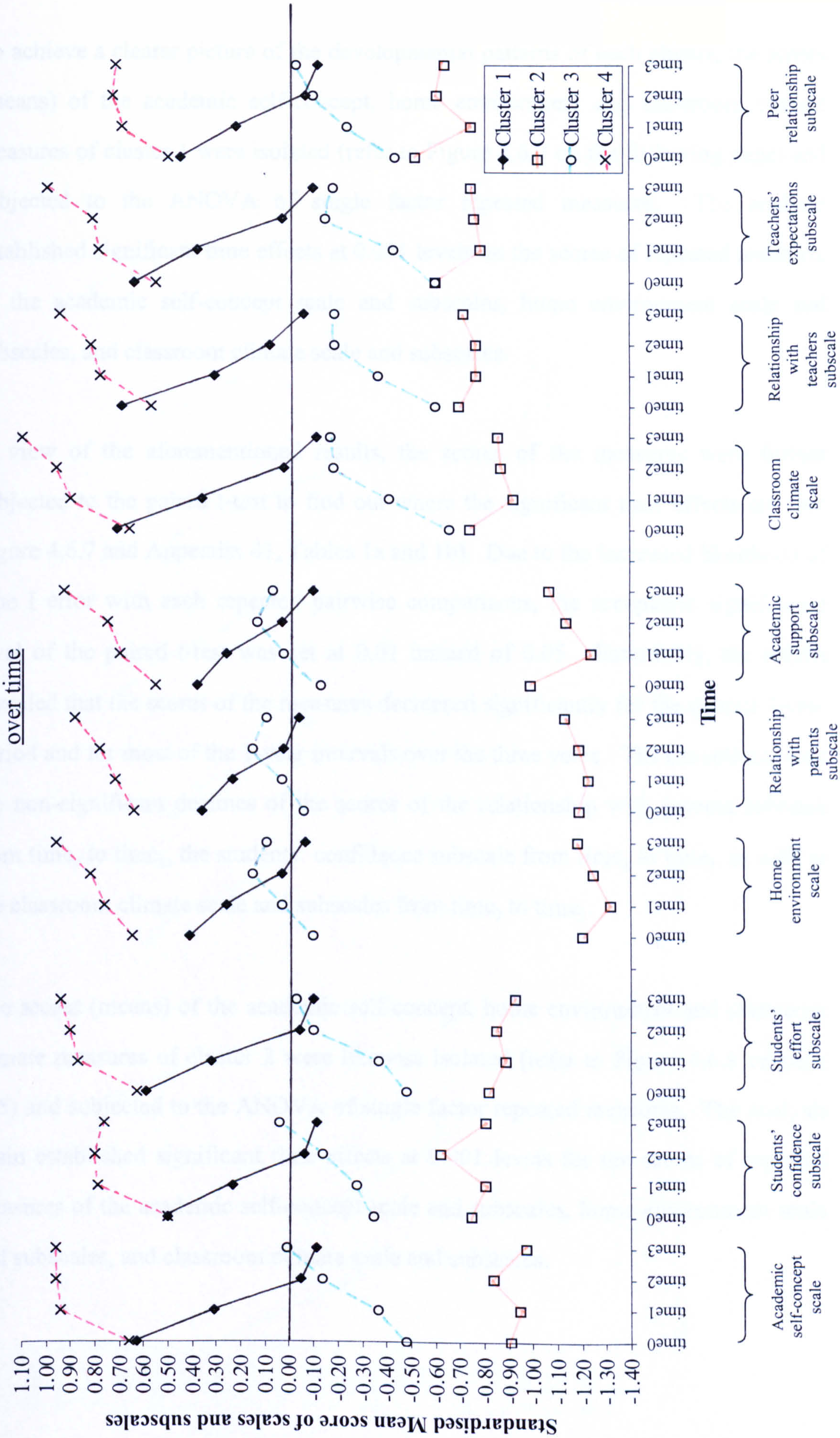


Figure 4.6.6: Academic self-concept, home environment and classroom climate standardised mean scores of the clusters over time

To achieve a clearer picture of the developmental patterns of each cluster, the scores (means) of the academic self-concept, home environment and classroom climate measures of cluster 1 were isolated (refer to Figure 4.6.7 on the following page) and subjected to the ANOVA of single factor repeated measures. The analysis established significant time effects at 0.001 levels on the scores of repeated measures of the academic self-concept scale and subscales, home environment scale and subscales, and classroom climate scale and subscales.

In view of the aforementioned results, the scores of the measures were further subjected to the paired t-test to find out where the significant time effects lay (see Figure 4.6.7 and Appendix 41, Tables 1a and 1b). Due to the increased likelihood of type I error with each repeated pairwise comparisons, the acceptable significance level of the paired t-test was set at 0.01 instead of 0.05. Essentially, the results revealed that the scores of the measures decreased significantly for the overall 3-year period and for most of the 1-year intervals over the three years. The exceptions were the non-significant declines of the scores of the relationship with parents subscale from $time_0$ to $time_1$, the students' confidence subscale from $time_2$ to $time_3$, as well as the classroom climate scale and subscales from $time_2$ to $time_3$.

The scores (means) of the academic self-concept, home environment and classroom climate measures of cluster 2 were likewise isolated (refer to Figure 4.6.8 on page 255) and subjected to the ANOVA of single factor repeated measures. The analysis again established significant time effects at 0.001 levels for the scores of repeated measures of the academic self-concept scale and subscales, home environment scale and subscales, and classroom climate scale and subscales.

Figure 4.6.7: Academic self-concept, home environment and classroom climate mean scores of cluster 1 over time

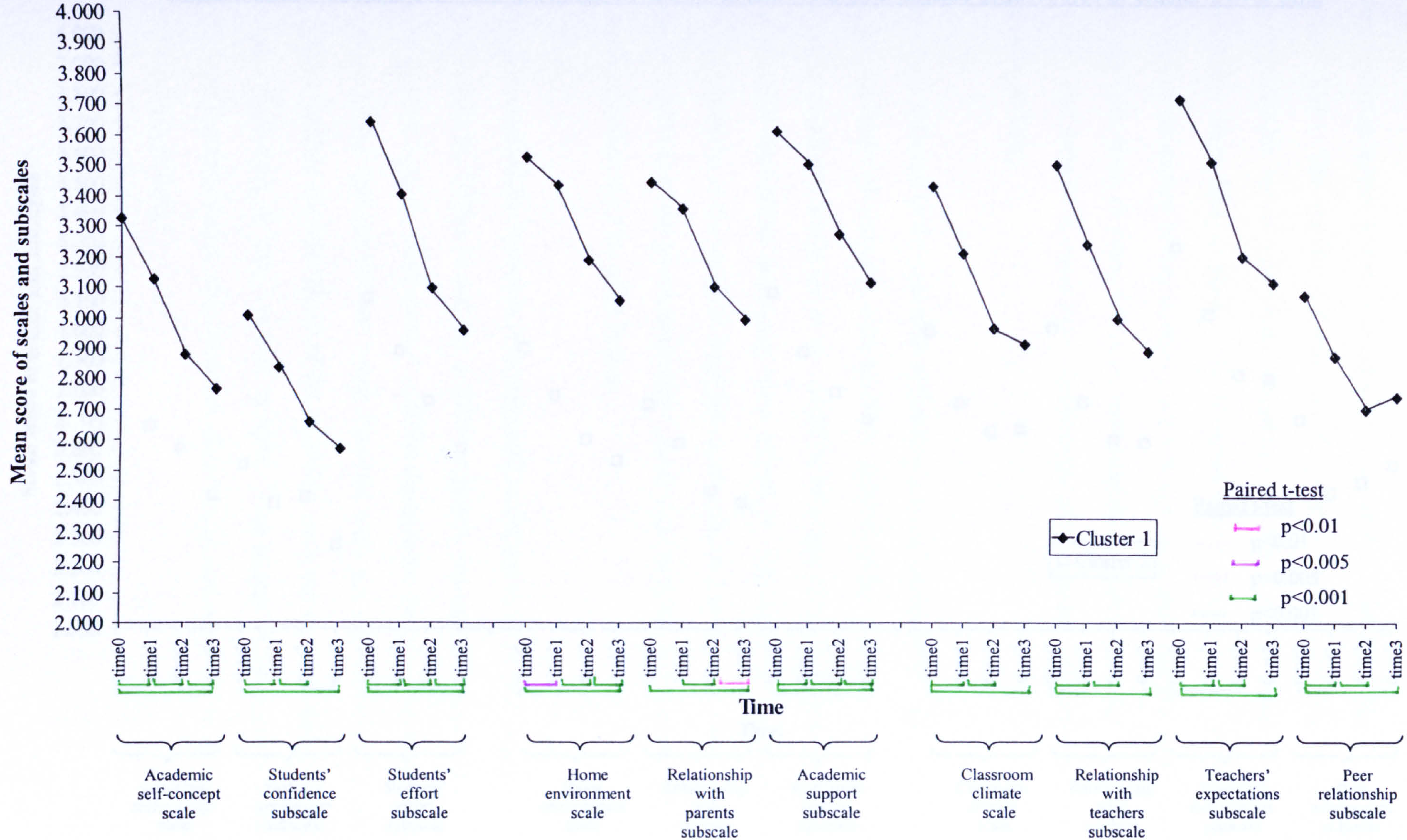
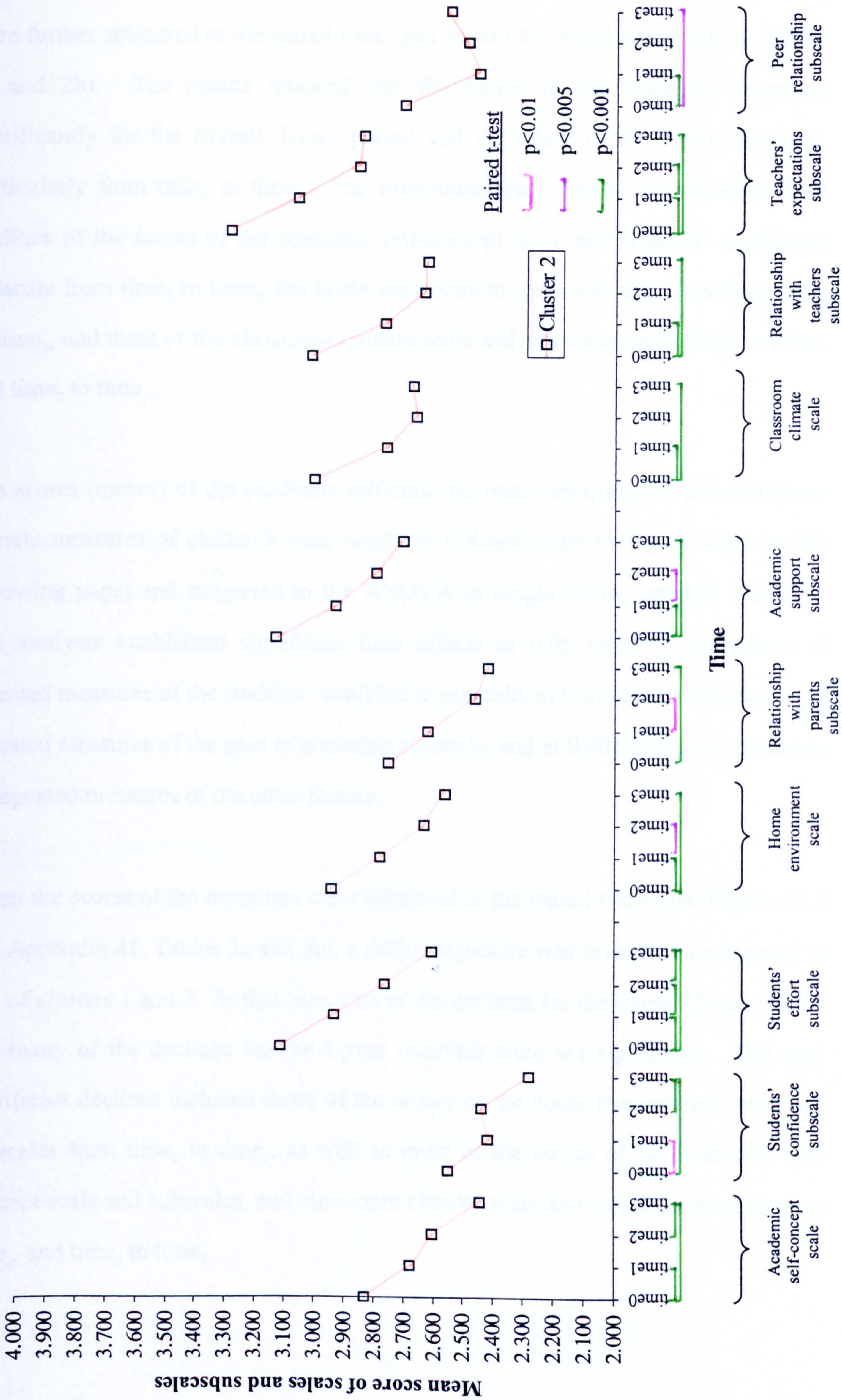


Figure 4.6.8: Academic self-concept, home environment and classroom climate mean scores of cluster 2 over time

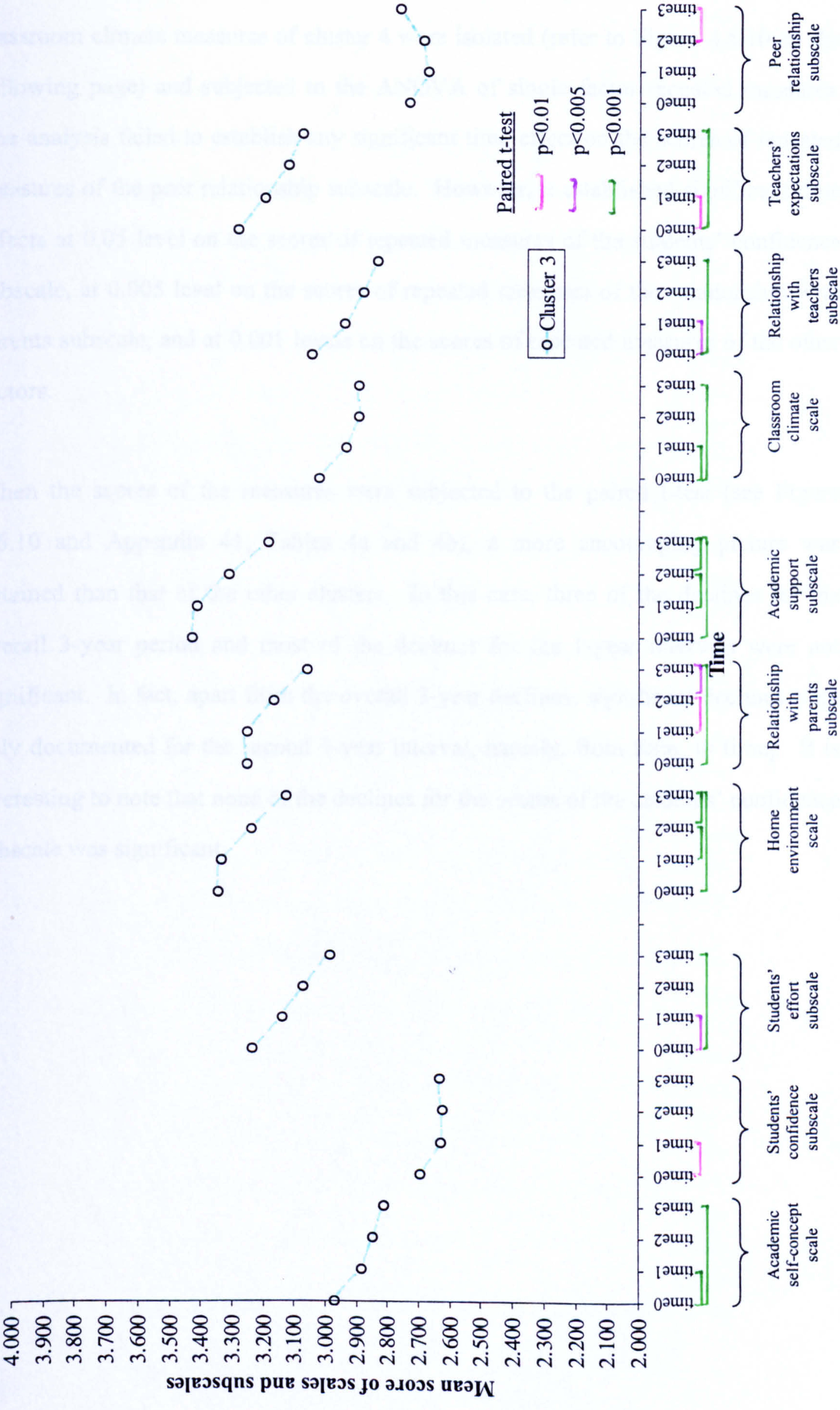


To have an idea of where the significant time effects lay, the scores of the measures were further subjected to the paired t-test (see Figure 4.6.8 and Appendix 41, Tables 2a and 2b). The results revealed that the scores of the measures decreased significantly for the overall 3-year period and for many of the 1-year intervals, particularly from $time_0$ to $time_1$. The exceptions were mainly the non-significant declines of the scores of the academic self-concept scale and students' confidence subscale from $time_1$ to $time_2$, the home environment scale and subscales from $time_2$ to $time_3$, and most of the classroom climate scale and subscales from $time_1$ to $time_2$, and $time_2$ to $time_3$.

The scores (means) of the academic self-concept, home environment and classroom climate measures of cluster 3 were similarly isolated (refer to Figure 4.6.9 on the following page) and subjected to the ANOVA of single factor repeated measures. The analysis established significant time effects at 0.05 level on the scores of repeated measures of the students' confidence subscale, at 0.01 level on the scores of repeated measures of the peer relationship subscale, and at 0.001 levels on the scores of repeated measures of the other factors.

When the scores of the measures were subjected to the paired t-test (see Figure 4.6.9 and Appendix 41, Tables 3a and 3b), a different picture was revealed as compared to that of clusters 1 and 2. In this case, two of the declines for the overall 3-year period and many of the declines for the 1-year intervals were not significant. The non-significant declines included those of the scores of the home environment scale and subscales from $time_0$ to $time_1$, as well as most of the scores of the academic self-concept scale and subscales, and classroom climate scale and subscales from $time_1$ to $time_2$, and $time_2$ to $time_3$.

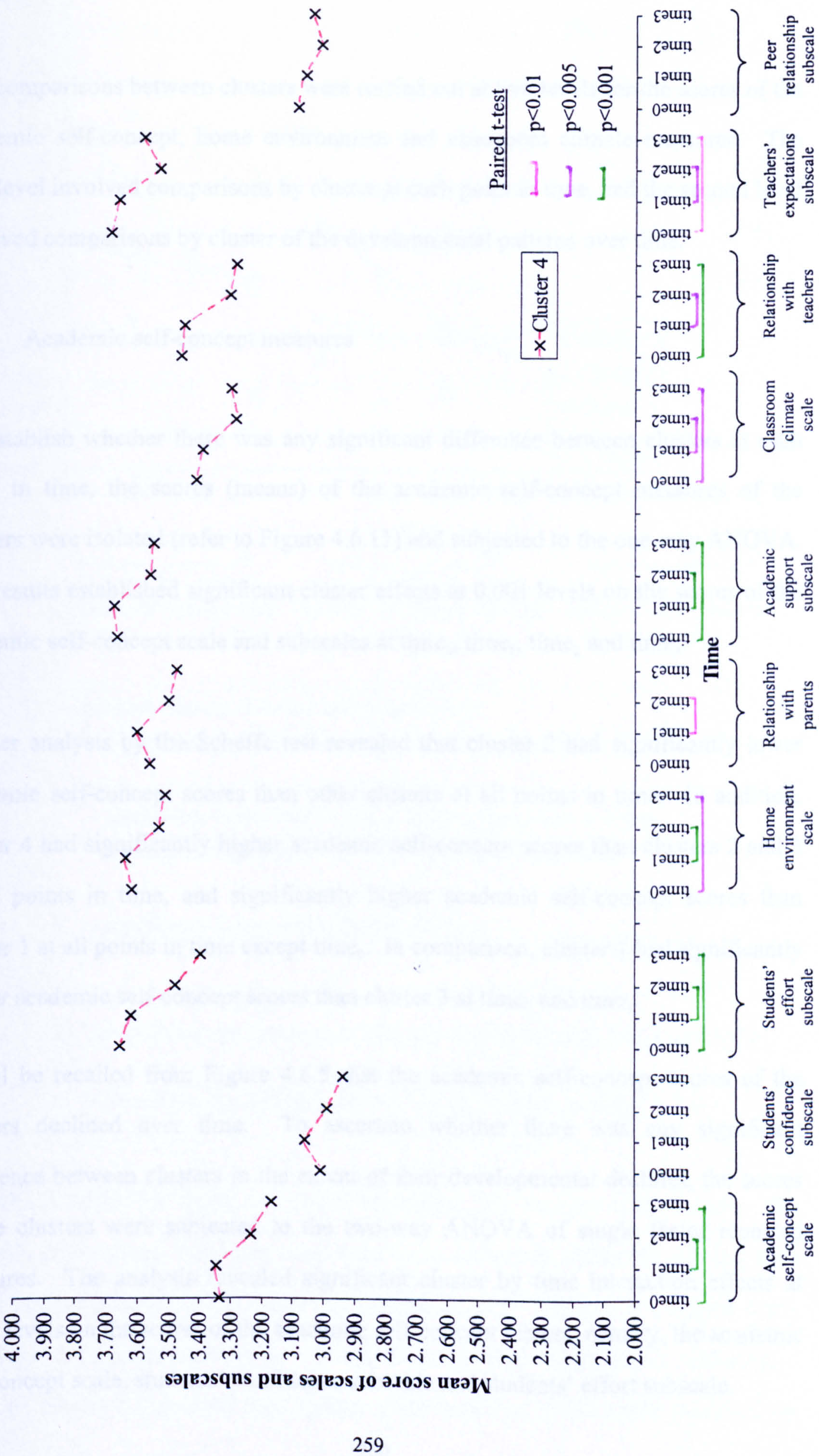
Figure 4.6.9: Academic self-concept, home environment and classroom climate mean scores of cluster 3 over time



Finally, the scores (means) of the academic self-concept, home environment and classroom climate measures of cluster 4 were isolated (refer to Figure 4.6.10 on the following page) and subjected to the ANOVA of single factor repeated measures. The analysis failed to establish any significant time effect on the scores of repeated measures of the peer relationship subscale. However, it established significant time effects at 0.05 level on the scores of repeated measures of the students' confidence subscale, at 0.005 level on the scores of repeated measures of the relationship with parents subscale, and at 0.001 levels on the scores of repeated measures of the other factors.

When the scores of the measures were subjected to the paired t-test (see Figure 4.6.10 and Appendix 41, Tables 4a and 4b), a more encouraging picture was obtained than that of the other clusters. In this case, three of the declines for the overall 3-year period and most of the declines for the 1-year intervals were not significant. In fact, apart from the overall 3-year declines, significant declines were only documented for the second 1-year interval, namely, from $time_1$ to $time_2$. It is interesting to note that none of the declines for the scores of the students' confidence subscale was significant.

Figure 4.6.10: Academic self-concept, home environment and classroom climate mean scores of cluster 4 over time



Comparisons between clusters

The comparisons between clusters were carried out at two levels for the scores of the academic self-concept, home environment and classroom climate measures. The first level involved comparisons by cluster at each point in time, and the second level involved comparisons by cluster of the developmental patterns over time.

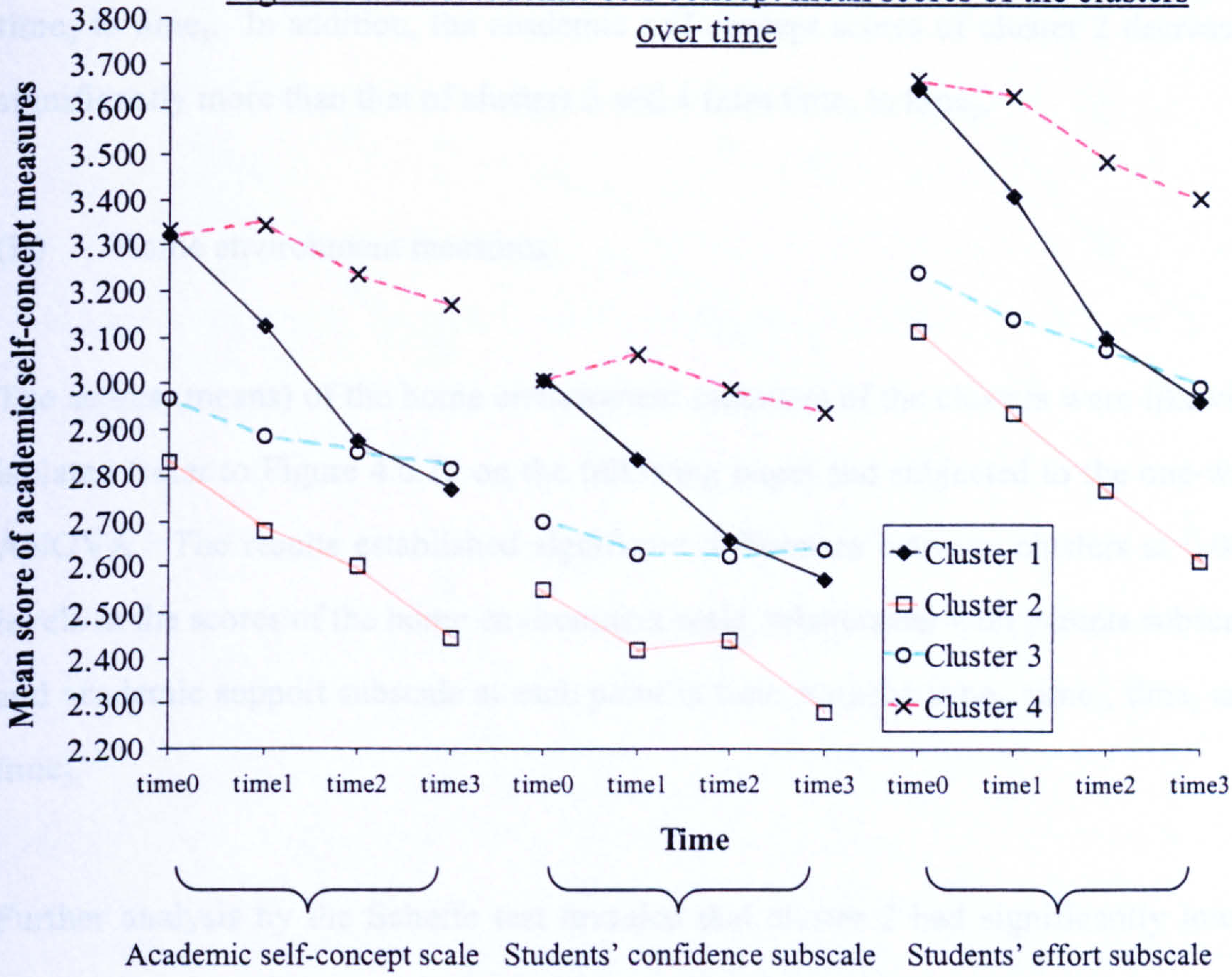
(I) Academic self-concept measures

To establish whether there was any significant difference between clusters at each point in time, the scores (means) of the academic self-concept measures of the clusters were isolated (refer to Figure 4.6.11) and subjected to the one-way ANOVA. The results established significant cluster effects at 0.001 levels on the scores of the academic self-concept scale and subscales at $time_0$, $time_1$, $time_2$ and $time_3$.

Further analysis by the Scheffe test revealed that cluster 2 had significantly lower academic self-concept scores than other clusters at all points in time. In addition, cluster 4 had significantly higher academic self-concept scores than clusters 2 and 3 at all points in time, and significantly higher academic self-concept scores than cluster 1 at all points in time except $time_0$. In comparison, cluster 1 had significantly higher academic self-concept scores than cluster 3 at $time_0$ and $time_1$.

It will be recalled from Figure 4.6.5 that the academic self-concept scores of the clusters declined over time. To ascertain whether there was any significant difference between clusters in the extent of their developmental declines, the scores of the clusters were subjected to the two-way ANOVA of single factor repeated measures. The analysis revealed significant cluster by time interaction effects at 0.001 levels on the scores of the academic self-concept factors, namely, the academic self-concept scale, students' confidence subscale and students' effort subscale.

Figure 4.6.11: Academic self-concept mean scores of the clusters over time



Note:

(I) Comparisons between clusters at each point in time

□ - significantly lower than ◆ , ○ and × at $time_0$, $time_1$, $time_2$ and $time_3$

× - significantly higher than □ and ○ at $time_0$, $time_1$, $time_2$ and $time_3$
- significantly higher than ◆ at all points in time except $time_0$

◆ - significantly higher than ○ at $time_0$ and $time_1$

(II) Comparisons of developmental patterns between clusters

◆ - overall decrease from $time_0$ to $time_3$ was significantly more than □ , × and ○

□ - overall decrease from $time_0$ to $time_3$ was significantly more than ○ and ×

To establish where the significant cluster effects lay, the changes in the scores of the academic self-concept measures over time were computed independently for each cluster and subjected to the Scheffe test (Appendix 42). The results revealed many significant differences between the clusters. Most notably, the academic self-concept scores of cluster 1 decreased significantly more than that of the other clusters from

$time_0$ to $time_3$. In addition, the academic self-concept scores of cluster 2 decreased significantly more than that of clusters 3 and 4 from $time_0$ to $time_3$.

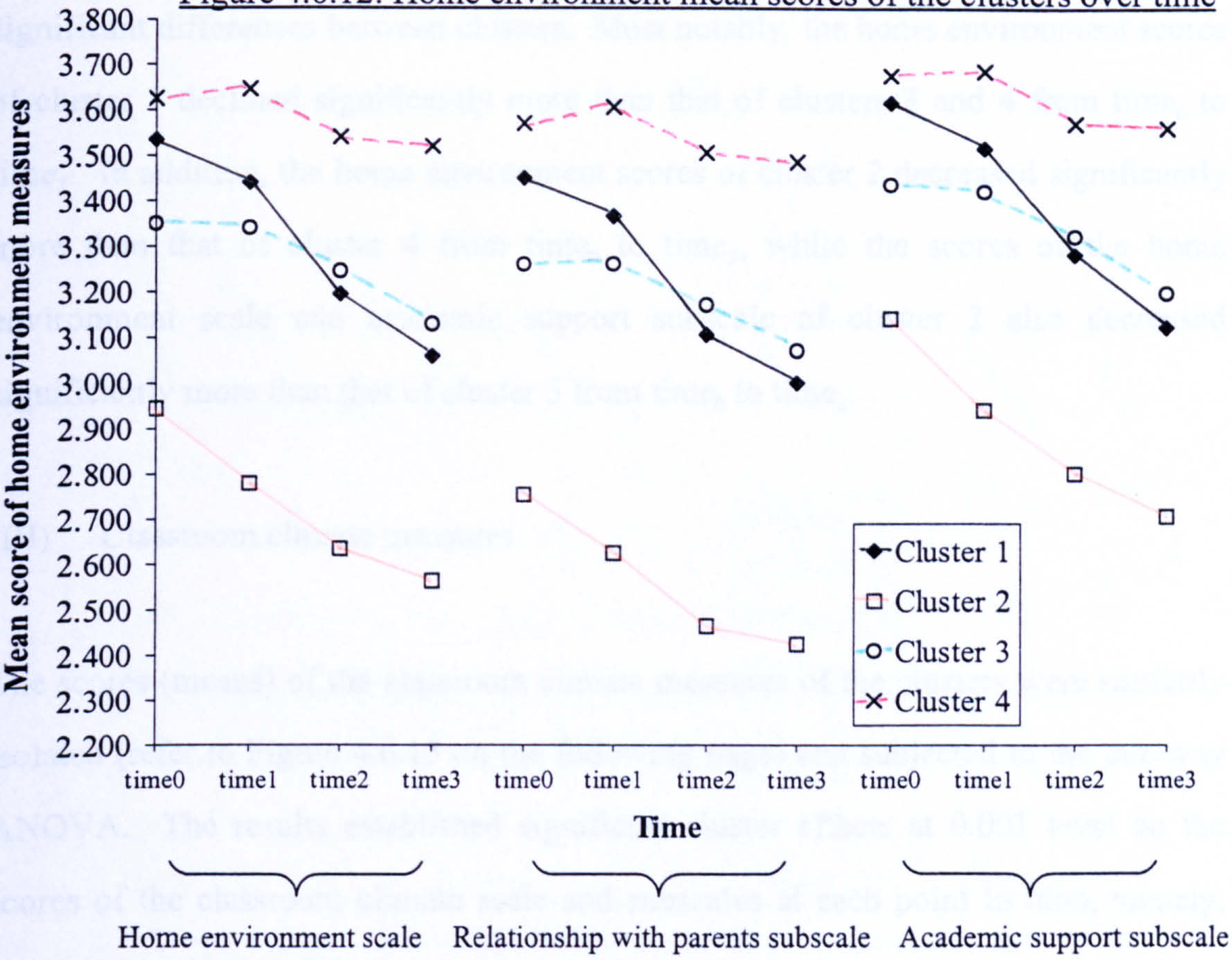
(II) Home environment measures

The scores (means) of the home environment measures of the clusters were likewise isolated (refer to Figure 4.6.12 on the following page) and subjected to the one-way ANOVA. The results established significant differences between clusters at 0.001 levels in the scores of the home environment scale, relationship with parents subscale and academic support subscale at each point in time, namely, $time_0$, $time_1$, $time_2$ and $time_3$.

Further analysis by the Scheffe test revealed that cluster 2 had significantly lower home environment scores than other clusters at $time_0$, $time_1$, $time_2$ and $time_3$. In addition, cluster 4 had significantly higher home environment scores than clusters 2 and 3 at $time_0$, $time_1$, $time_2$ and $time_3$, and significantly higher home environment scores than cluster 1 at all points in time except $time_0$. Comparatively, cluster 1 had significantly higher home environment scores than cluster 3 at $time_0$.

In an effort to determine whether there was any significant difference between clusters in their developmental patterns, the scores of the clusters were subjected to the two-way ANOVA of single factor repeated measures. The results established significant cluster by time interaction effects at 0.001 levels on the scores of the home environment factors, namely, the home environment scale, relationship with parents subscale and academic support subscale.

Figure 4.6.12: Home environment mean scores of the clusters over time



Note:

(I) Comparisons between clusters at each point in time

□ - significantly lower than ◆ , × and ○ at $time_0$, $time_1$, $time_2$ and $time_3$

× - significantly higher than □ and ○ at $time_0$, $time_1$, $time_2$ and $time_3$
- significantly higher than ◆ at all points in time except $time_0$

◆ - significantly higher than ○ at $time_0$

(II) Comparisons of developmental patterns between clusters

◆ - overall decrease from $time_0$ to $time_3$ was significantly more than × and ○

□ - overall decrease from $time_0$ to $time_3$ was significantly more than ×
- overall decrease from $time_0$ to $time_3$ was significantly more than ○ for Home and SupporA

On the basis of the aforementioned interaction effects, the changes in the scores of home environment measures over time were computed independently for each cluster and subjected to the Scheffe test (Appendix 43). The results revealed many significant differences between clusters. Most notably, the home environment scores of cluster 1 declined significantly more than that of clusters 3 and 4 from $time_0$ to $time_3$. In addition, the home environment scores of cluster 2 decreased significantly more than that of cluster 4 from $time_0$ to $time_3$, while the scores of the home environment scale and academic support subscale of cluster 2 also decreased significantly more than that of cluster 3 from $time_0$ to $time_3$.

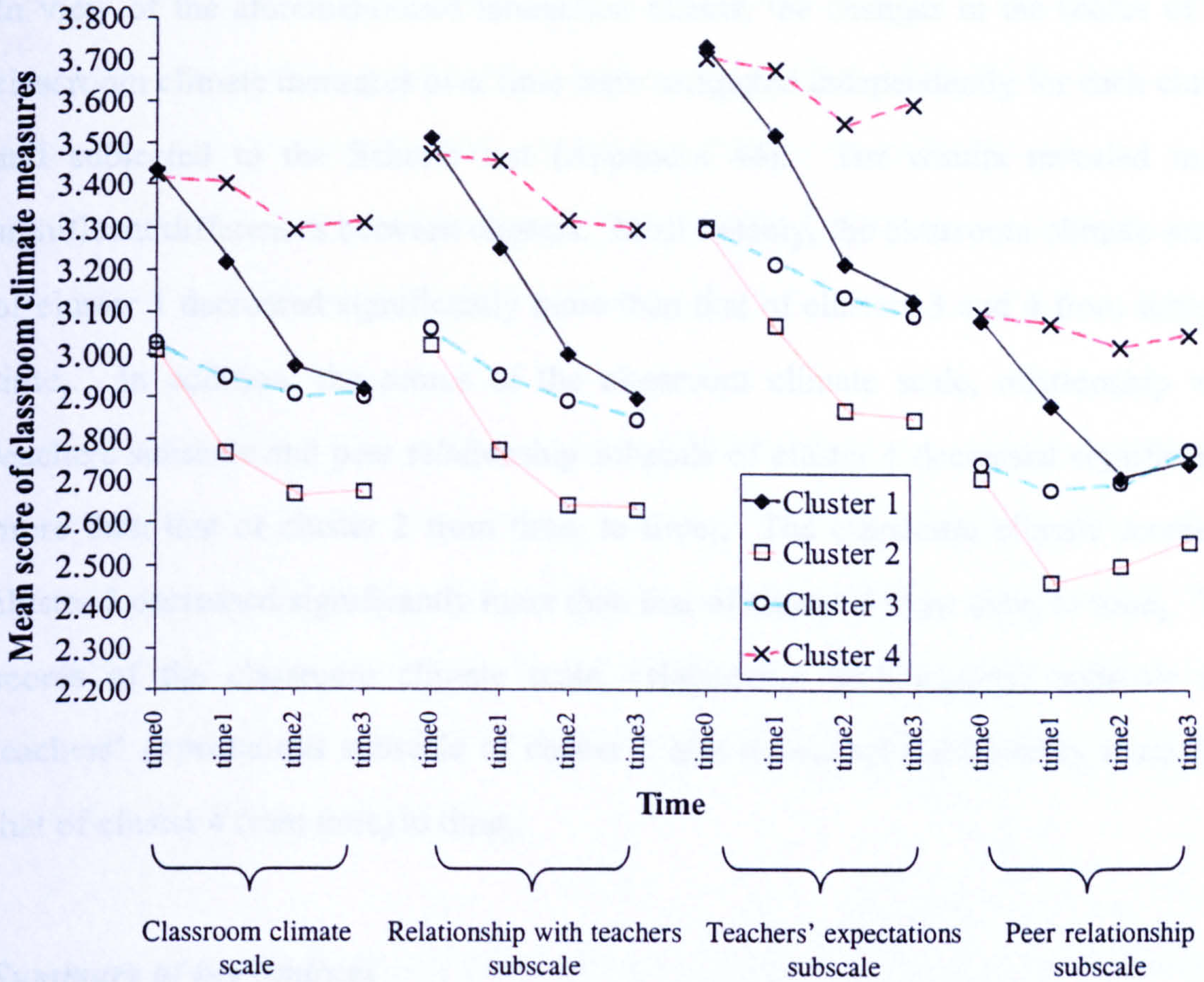
(III) Classroom climate measures

The scores (means) of the classroom climate measures of the clusters were similarly isolated (refer to Figure 4.6.13 on the following page) and subjected to the one-way ANOVA. The results established significant cluster effects at 0.001 level on the scores of the classroom climate scale and subscales at each point in time, namely, $time_0$, $time_1$, $time_2$ and $time_3$.

Further analysis by the Scheffe test revealed that cluster 2 had significantly lower classroom climate scores than clusters 1 and 4 at all points in time, and significantly lower classroom climate scores than cluster 3 at all points in time except $time_0$. In addition, cluster 4 had significantly higher classroom climate scores than clusters 2 and 3 at all points in time, and significantly higher classroom climate scores than cluster 1 at all points in time except $time_0$. Cluster 1 also had significantly higher classroom climate scores than cluster 3 at $time_0$ and $time_1$.

In an effort to establish whether there was any significant difference between clusters in their developmental patterns, the scores of the clusters were subjected to the two-way ANOVA of single factor repeated measures. The results established significant cluster by time interaction effects at 0.001 levels on the scores of the classroom climate factors, that is, the classroom climate scale and subscales.

Figure 4.6.13: Classroom climate mean scores of the clusters over time



Note:

(I) Comparisons between clusters at each point in time

□ - significantly lower than ◆ and × at $time_0$, $time_1$, $time_2$ and $time_3$

- significantly lower than ○ at all points in time except $time_0$

× - significantly higher than □ and ○ at $time_0$, $time_1$, $time_2$ and $time_3$

- significantly higher than ◆ at all points in time except $time_0$

◆ - significantly higher than ○ at $time_0$ and $time_1$

(II) Comparisons of developmental patterns between clusters

◆ - overall decrease from $time_0$ to $time_3$ was significantly more than × and ○

- overall decrease from $time_0$ to $time_3$ was significantly more than □ for Class, RelatT and Peer

□ - overall decrease from $time_0$ to $time_3$ was significantly more than ○

- overall decrease from $time_0$ to $time_3$ was significantly more than × for Class, RelatT and TExpect

In view of the aforementioned interaction effects, the changes in the scores of the classroom climate measures over time were computed independently for each cluster and subjected to the Scheffe test (Appendix 44). The results revealed many significant differences between clusters. Most notably, the classroom climate scores of cluster 1 decreased significantly more than that of clusters 3 and 4 from $time_0$ to $time_3$. In addition, the scores of the classroom climate scale, relationship with teachers subscale and peer relationship subscale of cluster 1 decreased significantly more than that of cluster 2 from $time_0$ to $time_3$. The classroom climate scores of cluster 2 decreased significantly more than that of cluster 3 from $time_0$ to $time_3$. The scores of the classroom climate scale, relationship with teachers subscale and teachers' expectations subscale of cluster 2 also decreased significantly more than that of cluster 4 from $time_0$ to $time_3$.

Summary of key findings

To summarise, four distinct groups of students were identified from the overall sample. The first group, that is, cluster 1, had significantly more Express students than other clusters. In addition, it had the highest mean for PSLE results, albeit not significantly different from other clusters. In line with the positive starting point, cluster 1 students started with very high scores for the academic self-concept, home environment and classroom climate measures. Most of the scores were significantly higher than that of clusters 2 and 3 at $time_0$ and $time_1$. However, the initial high scores of the academic self-concept, home environment and classroom climate factors decreased substantially over time, and most of the decreases from $time_0$ to $time_3$ were significantly more pronounced than that of the other clusters.

The second group, that is, cluster 2, painted a highly distressing picture. In this case, the students did not have the lowest PSLE results, neither did they have the most number of Normal students. Nevertheless, they started with very low scores for the academic self-concept, home environment and classroom climate measures, which remained consistently low over time. In fact, most of the scores were significantly lower than that of other clusters. Moreover, the scores of the factors decreased significantly from $time_0$ to $time_3$, and in most cases, the decreases were significantly more than that of clusters 3 and 4.

It is noteworthy that for cluster 2, the standardised means of students' home environment measures appeared to be much lower than that of other clusters. They were also much lower than the standardised means of their classroom climate measures. The evidence suggests that the students could be less happy with their home environment as compared to other students, as well as compared to their own perception of classroom climate.

The third group, that is, cluster 3, established a more promising picture. In essence, the students started with standardised scores slightly below that of the overall sample (standardised means of 0), nevertheless, most of them became closer to the norm over time. Incidentally, the disparities between them and cluster 1 failed to reach statistical significance after $time_1$. In most cases, the overall decreases over time for these students were also significantly less than that of clusters 1 and 2.

It is interesting to note that for cluster 3, the standardised means of students' classroom climate measures appeared to be lower than that of their home environment measures. The finding highlights the possibility that these students were less happy about their classroom climate than their home environment.

The fourth group, that is, cluster 4, painted the most promising picture. In this case, the students had the lowest PSLE results, albeit not significantly different from the students in other clusters. In addition, they had significantly fewer Express students than cluster 1. Nonetheless, they had significantly higher scores for the academic self-concept, home environment and classroom climate measures than clusters 2 and 3 at $time_0$, $time_1$, $time_2$ and $time_3$, and they had significantly higher scores than cluster 1 at all points in time except $time_0$. In addition, the overall decreases of most of the scores of the factors were also significantly less than that of clusters 1 and 2. The interpretation of the findings is not straightforward, especially in terms of causal directions, but it is noteworthy that the students had significantly higher mean for Secondary 1 class position than the students in other clusters, and higher mean for Secondary 2 class position than the students in clusters 1 and 2.

Taken together, the results established that there were four distinct groups of students with largely different academic self-concept, and perceptions of home environment and classroom climate at different points in time. They also had different developmental trends over time. However, most of the trends were significant declines over the 3-year period. This finding is indeed significant as there has been concern about the relevance of studying average change over time across all subjects. The problem with the analysis is that it focuses on the averaged mean of the sample so subtle changes in different subgroups of students may be masked (Hirsh & DuBois, 1991). The results of the clusters, however, shows that the developmental declines documented for the overall sample are real changes experienced by most students (see Sections 4.1.1, 4.2.1. and 4.3.1).

For convenience, clusters 1, 2, 3 and 4 would be referred to as the steeply decreasing, consistently low, moderate and declining, and consistently high clusters respectively for future discussions.

Chapter Five

Discussions

This chapter deals with a number of issues in sequence. First and foremost, the key results obtained in Chapter 4 are discussed in relation to some of the earlier findings. Thereafter, a summary is given to underline the most significant findings. Before the concluding remarks, the implications and limitations of this study are also highlighted.

The organisation of the first part of the chapter, namely, the discussion of results, is similar to that of Chapter 4. In essence, the six main sections are

5.1 Comparison of Students' Academic Self-Concept;

5.2 Comparison of Students' Perception of Home Environment;

5.3 Comparison of Students' Perception of Classroom Climate;

5.4 Relationships between Students' Academic Self-Concept and their Perceived Home Environment and Classroom Climate;

5.5 Predictors of Students' Academic Self-Concept; and

5.6 Additional Subgroups Comparisons.

Section 5.1 to Section 5.5 are further divided into five subsections, namely, overall sample, male and female students, Express and Normal students, Lower Express and Higher Normal students, and summary of main points. Section 5.6 is divided into two subsections, namely, ability bands of students, and clusters of students.

After the discussion of results, five additional main sections are included. They are

5.7 Main Findings of the Study;

5.8 Implications for Singapore;

5.9 Implications for Theory and Future Research;

5.10 Limitations of the Study; and

5.11 Concluding Remarks.

5.1 Comparison of Students' Academic Self-Concept

Three broad categories of research questions pertaining to students' academic self-concept are discussed in this section. They are developmental changes over time, subgroup comparisons at each point in time, and subgroup comparisons of changes over time (see Section 2.8).

5.1.1 Overall Sample

Developmental changes in students' academic self-concept

It will be recalled that the students' academic self-concept scores were reasonably high over the 3-year period. However, they decreased significantly for each of the 1-year intervals over the three years and the overall 3-year period.

The present findings of the overall academic self-concept scale are consistent with that of Marsh et al. (1985), Marsh (1989) and Lau (1990) for students in Grades 7 to 9 (similar to Secondary 1 to 3). As noted in the literature review, the studies documented curvilinear age effects on students' school-related self-concept from preadolescence to early adulthood (see Section 2.3.1b). Specifically, Marsh et al. (1985) reported that students had the highest school self-concept at Grades 7, 11 and

12, and the lowest at Grade 9. Likewise, Marsh's (1989) combined findings of students in Grades 2 to 9, Grades 7 to 11, and age 15 and above, revealed a significant decline in student's school self-concept from Grade 2 to Grade 9, followed by a significant increase after Grade 9. Similarly, Lau (1990) established that there was a significant decrease in student's academic self-concept from Grade 7 to Grade 9, followed by a steady increase from Grade 9 to Grade 13 in study 1. The findings were substantiated in study 2, which again revealed that the decline of student's academic self-concept from Grades 7 and 8 to Grade 9 was statistically significant.

While the current findings are different from that of Alawiye and Alawiye (1988) and Liu (1994), the interpretation of age effect in those two studies is questionable since both of them included only two grade levels of adolescents, that is, Grades 6 and 8 in Alawiye and Alawiye's (1988), and Grades 7 and 10 in Liu's (1994). Thus, the results of those studies will not be referred to for further discussion on developmental changes.

Since the decline in students' academic self-concept occurs during adolescence, the negative age effect may be rationalised in part from the 'crisis' perspective, that is, the decline is related to changes that take place during adolescence. Essentially, adolescents experience numerous changes such as physiological changes due to puberty, cognitive changes, shifting societal expectations, conflicting role demands, increasingly complex relations with parents, peers and the opposite sex, and often choices of school courses and changes in school environment (Alsaker & Olweus, 1993; Block & Robins, 1993; Bolognini et al., 1996; Coleman & Hendry, 1990; Dacey & Kenny, 1997). Amongst them, one particular difficult change for young adolescents must be changes in school environment. Secondary schools are generally larger than primary schools so they present students with a larger social comparison network, and the added challenges of establishing themselves and finding their own niches. Presumably, most students will establish themselves with time, and the situation will get better with each grade level. Nonetheless, students can be overlooked in larger schools and many may not have the chance to participate and excel in class or school activities (Dacey & Kenny, 1997). Thus, some students may have difficulty achieving the same level of social recognition experienced in their primary schools. Considering that self-concept is essentially a social product of reflected appraisals (Cooley, 1912; Mead, 1934), this lack of recognition may have an effect on adolescents' sense of well-being and their academic self-concept.

In addition, the difficulty encountered by young adolescents in secondary schools may be compounded by perceived changes in student-teacher relationships. Primary school teachers typically teach a number of subjects, so they spend considerable time with their students and get to know them well. In contrast, secondary school teachers are more specialised, often teaching only one or two subjects. They see less of their students, and spend much of their limited time covering academic content, causing many secondary students to lament that they know few or none of their teachers well (Seidman, Allen, Aber, Mitchell & Feinman, 1994). In view of the fact that teachers are 'the backbone of the education system' (p. 92, Thomas, 1980) and are possible determining influence in moulding students' self-concept (Thomas, 1980), it is tenable that the less personal student-teacher relationships may have a negative impact on students' academic self-concept.

Burns (1982) noted that the 'school is a context in which evaluation and competition is pervasive, continuous and systematic' (p. 202). Since there is an increase use of social comparison amongst students, and an increase emphasis on evaluation, competition and performance with grade levels (Harter, Whitesell & Kowalski, 1992), the situation in secondary schools is clearly worse than in primary schools. Considering that secondary students have to face frequent reminders of their potentials and limitations, successes and failures, and have to cope with the intense pressure of extensive evaluations, it is tenable that their academic self-concept should decline with age. Indeed, the negative effects of competition and evaluation may be acutely felt by Singaporean students because of the huge societal emphasis on education and the prevailing cultural pressure to succeed in the chase for paper qualifications.

In summary, the results provide a clear answer to **research question 1(a)(i)** (Section 2.8). That is, *there is a significant developmental change in students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3.* Specifically, students' academic self-concept declines over time.

5.1.2 Male and Female Students

Developmental changes in male and female students' academic self-concept

As highlighted in Chapter 4.1.2, the developmental changes in male and female students' academic self-concept scores were similar to that of the overall sample in that the scores decreased significantly for the overall 3-year period, and for most of the 1-year intervals.

The present findings of the overall academic self-concept scale are consistent with that of Marsh et al. (1985), Marsh (1989) and Lau (1990) for the same age group of students. In essence, the earlier studies established negative age effects on the academic self-concept of the overall sample, as well as the male and female students, from early to middle adolescence.

The results suggest that adolescence is an equally difficult period of adjustment for both genders. Considering the changes that take place, the findings are not unexpected. In summary, the results provide clear answers to **research questions**

1(b)(i) and 1(b)(ii) (Section 2.8). That is, *there are significant developmental changes in male and female students' academic self-concepts, as wholes or in specific areas, from Secondary 1 to Secondary 3.* Specifically, male and female students' academic self-concepts largely decline over time.

Subgroup comparisons of students' academic self-concept

It will be recalled that the female students had higher scores for the students' effort subscales at $time_0$, $time_1$, $time_2$ and $time_3$, and lower score for the students' confidence subscale at $time_2$ than the male students.

Since subgroup comparisons of students' academic self-concept were carried out at each point in time, these findings are comparable with earlier studies that have covered the same age range, even if only one age group has been examined. Thus, the present results are consistent with that of Liu (1994). Specifically, the earlier study of Secondary 1 and 4 students established that female students had significantly higher score for the students' effort subscale, and lower score for the students' confidence subscale than male students.

The present findings are, however, in contrast to that obtained by Quek (1988). In essence, Quek's study of Secondary 3 students failed to establish any significant gender effect on the scores of the students' confidence and students' effort subscales.

The disparity between Quek's (1988) results and the findings of Liu (1994) and the current study might be explained by the fact that Quek's sample comprised of two girls' schools, two boys' schools, and five coeducational schools. Since gender differences are more pronounced in coeducational settings (Marsh et al., 1983), the inclusion of non-coeducational schools could have diluted the gender effects and rendered them non-significant. The interpretations of the current study and Liu

(1994) are not complicated by the use of non-coeducational schools, so it is clear that in coeducational schools in Singapore, gender differences exist in students' perceptions of their academic confidence and effort.

Rosenberg and Simmons (1975) noted that adolescence girls are more concerned about being well-liked, more affected by others' opinion of them, and more eager to avoid behaviour that elicits negative reaction. In this view, it is not surprising that girls are willing to put in more effort in their work since they will be zealous in pleasing their significant others and eager to conform to socially desirable behaviour. The proposition is supported in this study by the students' responses in the questionnaire. Essentially, female students were more positive than their male counterparts about *paying attention to their teachers during lessons*. They were less inclined to agree that they *always waited for the lessons to end,* and they day*dreamed a lot in class*. They were also less disposed to agree that they *often felt like quitting schools,* and they did *their homework without thinking*. Moreover, they were more inclined to disagree that *they were not willing to put in additional effort in their schoolwork.*

However, the findings that female students had significantly lower academic confidence than male students is harder to explain, especially since both genders had comparable non-verbal reasoning test scores (see Section 3.2.2, Table 3.2.4). Indeed, female students had significantly better PSLE results (see Section 3.2.2, Table 3.2.2), and Secondary 1 and 2 class positions than their male counterparts (see Section 3.2.2, Table 3.2.6).

On the basis of their better academic results, it is poignant that female students, as compared to male students, were more inclined to agree that *most of their classmates were smarter than them,* and they were *frightened when asked questions by their* *teachers*. Furthermore, many of them were more disposed to disagree that they were *confident of doing better than their friends in most subjects*.

One possible explanation of the finding could lie in the difference between genders in terms of their attitudes towards success. Dweck, Davidson, Nelson and Enna (1978) found that male students tend to make more internal attributions for success and more external attributions for failures than female students. Likewise, Nicholls (1975) noted that male students tend to attribute success to internal, stable dimension such as ability, but female students attribute success to external, unstable dimension such as luck. If female students discount their own achievements as luck, then it is conceivable that their confidence levels are not consistent with their achievements. Alternatively, there could also be gender difference in the way students assimilate feedback from their significant others. Since girls generally have a greater desire to please others (Rosenberg & Simmons, 1975), it is likely that reinforcements from significant others may have a greater impact on their perception of academic ability than on male students. Thus, a lack of recognition from parents or teachers may undermine the positive influence of their actual academic achievement.

Taken as a whole, the results suggest that there are important differences between genders in spite of their comparable overall academic self-concept. Specifically, male and female students differ in the way they define their academic self-concepts. While female students' relatively high overall academic self-concept is contingent upon their commitment and belief in hard work, male students' comparable overall academic self-concept is largely the result of their high confidence. In view of the current findings, it may be appropriate to take a closer look at existing academic self-concept instruments to check that they are not gender bias. Presumably, as noted by Burns (1982), some instruments may contain items more appropriate for endorsement by one gender than the other.

In sum, there is sufficient evidence to answer **research question 1(b)(iii)** (Section 2.8). Namely, *there is significant difference between genders in students' academic self-concept, as a whole or in specific areas, in Secondary 1, 2 and 3.*

Subgroup comparisons of changes in students' academic self-concept over time

As noted in Section 4.1.2, there was no significant difference between genders in the changes in their academic self-concept scores over time.

The aforementioned finding lends support to that of Marsh et al. (1985), and Marsh (1989). It is however in contrast to that of Lau (1990). For the secondary school sample in Lau's (1990) first study, a significant gender effect, in favour of boys, was established on students' academic self-concept. In addition, a significant grade by sex interaction effect was observed. Specifically, from Grade 7 to Grade 9, both genders witnessed a decrease in their academic self-concept, with the decrease being greater for girls. From Grade 9 onwards, the academic self-concept of both genders increased, but the increase was greater for boys. The second study presented largely congruent findings. In this case, no statistical test was employed to ascertain the significance of the gender effect on the changes of academic self-concept over time. Nonetheless, the decline from Grade 7 to Grade 9 appeared more pronounced for girls than boys.

To a certain extent, the inconsistencies in findings between Lau (1990) and that of the present study may be explicable by cultural differences. Despite Hong Kong's acceptance of Western technologies and its cosmopolitan appearance, it is at heart a traditional Chinese society. There is a relatively strong belief about the roles of males and females in the society, in which males are the main breadwinners of the families, and females play the supportive roles of wives and mothers. In line with such societal expectations, parents may have given more academic guidance and support to their sons than daughters. They may also have conveyed differential educational aspirations and expectations to their children when they were making decisions about their school or course choices. In such a situation, it is not surprising if there are differences between genders in the changes in their academic self-concept over time.

The situation in Singapore is rather different from in Hong Kong. Due to the successful implementation of the family planning programme by the government, the average family size in Singapore is quite small, with two or three children being the norm. The small family size ensures that most parents pay equal emphasis to their children's education, regardless of their sex. Moreover, Singapore has no other resources except its people, so the government's education policy is to 'maximise development of talents and abilities, and maximise harnessing of talents and abilities' (MOE, 1998d). As such, girls are not discriminated against, instead they are actively encouraged to excel in their studies and to build their careers. Consistent with the societal and parental expectations, schools also tend to treat both genders equally. Considering that both genders experience equal support and guidance from home and school, it is conceivable that there is no gender effect on the developmental changes in their academic self-concept from early to middle adolescence.

To conclude, in answer to **research question 1(b)(iv)** (Section 2.8), the results of the present study revealed that *there is no significant difference between genders in the changes in students' academic self-concept, as a whole or in specific areas, from Secondary 1 to Secondary 3.*

5.1.3 Express and Normal Students

Developmental changes in Express and Normal students' academic self-concept

As highlighted in Section 4.1.3, the developmental changes in Express and Normal students' academic self-concept scores were comparable with that of the overall sample in that most of the scores decreased significantly over time.

The developmental declines documented for the Express and Normal students suggest that the earlier interpretation of a negative age effect on the overall sample's academic self-concept is not complicated by a stream effect. The results affirm that regardless of stream, the majority of students go through a period of difficult adjustment during adolescence.

In sum, there is sufficient evidence to answer **research questions 1(c)(i) and 1(c)(ii)** (Section 2.8). That is, *there are significant developmental changes in Express and Normal students' academic self-concepts, as wholes or in specific areas, from Secondary 1 to Secondary 3.* Specifically, Express and Normal students' academic self-concepts predominantly decline over time.

Subgroup comparisons of students' academic self-concept

It will be recalled that the Express students had significantly higher scores for the academic self-concept scale (mainly female students) and students' effort subscale at $time_0$, and lower scores for the academic self-concept scale and students' confidence subscale at $time_3$ than the Normal students.

The stream effects, in favour of higher-ability stream students, at the start of the study are consistent with that of the reviewed studies. The stream effect on the scores of the students' academic self-concept scale mirrors that of Oakes (1982, 1985), Byrne (1988, 1990) and Liu (1994). Likewise, the stream effect on the scores of the students' effort subscale is comparable with that of Liu (1994). It also parallels the results of Oakes (1982, 1985), Berends (1995) and Vanfossen et al. (1987). In essence, the studies reported that lower-ability stream students had lower level of educational aspirations than their peers in the higher-ability stream.

The stream effects evident at the beginning of this study may be rationalised by the fact that streaming is largely a public endorsement of a student's ability or lack of it. Thus, notwithstanding influences from other sources, the streaming process per se may have a negative impact on the affective domains of students streamed into the lower-ability stream. Essentially, if a student is labelled publicly as being less academically inclined, it is explicable that the student may have more negative evaluation of his or her academic ability, and may be less motivated to put in effort in his or her academic work.

The aforementioned rationale is supported in the present study by the students' responses in the questionnaire. For instance during the first week of school, Normal students were more inclined than their Express counterparts to disagree that *they were able to do better than their friends in most subjects*. In addition, they were more disposed to agree that *they did poorly in their tests,* and *their teachers felt that they were poor in their work.* In view of such negative self-evaluations, it is comprehensible that they were more likely to disagree that *they paid attention to their teachers during lessons*. Taken together, the results appear to support Slavin's (1988) contention that streaming students into a lower-ability stream may have a stigmatising effect, which lowers students' expectations for achievement.

It has to be noted, however, that the stream effect on the scores of the academic self-concept scale was predominantly due to the difference between female students in the Express and Normal streams. The difference between the ability streams was not significant for the male students. Considering that female students are generally more eager to please and more keen to avoid behaviour that elicits negative responses (Rosenberg & Simmons, 1975), it is possible that being assigned to a lower-ability stream could have affected female students more acutely than male students.

The stream effects, in favour of lower-ability stream students, at the end of this study are not supported in the reviewed literature. The absence of similar findings may be related to the fact that none of the reviewed studies has examined long-term effects of streaming from a developmental perspective. Although there have been a number of extensive cross-sectional studies, many of them summed the responses of students across grade levels. For instance, Oakes (1982, 1985) aggregated the responses of students in the junior high and senior high levels. Byrne (1988, 1990) summed the responses of students from Grades 11 and 12 in the earlier study, and Grades 9 to 12 (sample 1), and Grades 11 and 12 (sample 2) in the latter study. Thus, it is possible that stream effects at different grade levels could have been masked. Finally, it is tenable that the inconsistencies in findings may be reflections of differences in educational policies, student selection and exit criteria, as well as geographical and cultural characteristics.

Although Liu (1994) combined the responses of students in Secondary 1 and 4 (Grades 7 and 10), it should be noted that there was no grade by stream interaction effect on students' academic self-concept. Thus, the result established that the stream effects, in favour of higher-ability stream students, were common for both early and middle adolescents. Clearly, Liu's finding of Secondary 4 students is inconsistent with that of the current Secondary 3 students. Since Liu's study was conducted in Singapore with the same instrument, the disparities in findings are not easily explicable. Without further evidence, it can only be speculated that the streaming policy has become more successful in recent years, and the stigmatising effect of stream membership may have been countervailed more effectively by other positive aspects of being in the lower-ability stream.

Despite being unprecedented, the stream effects established at the end of this study may be rationalised from two perspectives. The first perspective is that the stigmatising effect of streaming may be temporary. In the long run, being in the lower-ability stream, compared to the higher-ability stream, may be beneficial to students' academic self-concept. Such a contention is plausible in view of Marsh and Parker's (1984) 'Big-Fish-Little-Pond Effect' (BFLPE). In essence, they posited that students form their self-concept of academic ability by comparing their own ability (more or less objectively perceived) with the abilities of other students within their reference group. Since lower-ability stream students' reference group is less demanding (lower in average ability) than that of the higher-ability stream students, and they have a fair chance of experiencing success in their more homogenous classes, it is comprehensible that their academic self-concept may be equal to or higher than that of their higher-ability stream counterparts.

The postulation of a BFLPE is supported by the responses of the students at the end of the study. Compared to Express students, Normal students were more inclined to disagree that *their teachers felt that they were poor in their work*, and *they did poorly in their tests*. In addition, they were more likely to agree that *they were able to do better than their friends in most subjects*. In view of their positive perception, it is not surprising that they were also more inclined to agree that *they paid attention to the teachers during lessons*.

Nonetheless, the BFLPE cannot account wholly for the positive stream effects on the Normal students' academic self-concept. The reason may be related in part to certain aspects of the education policy in Singapore. For example, the presence of an exit criterion or lateral transfer in the streaming policy, which gives Normal students a chance to be upgraded to the Express stream if they are ready. Without such an exit criterion, the streaming exercise would be accepted as a final judgement, and being streamed into the Normal stream would have largely destroyed the students' academic self-concept. In addition, there is provision of an extra year for Normal students to complete their secondary education. Specifically, the education policy is such that Express and Normal students sit for their respective GCE 'O' and 'N' level examinations after four years of secondary education (refer to Section 1.2). Normal students who do well in their GCE 'N' level examination proceed to Secondary 5 and sit for their GCE 'O' level at the end of the year. In other words, Normal students are given five years to complete their GCE 'O' level curricula. The extra year is important as it allows teachers the luxury of spending more time on difficult topics and allows Normal students to learn at a slower pace, resulting in a less intensive and more supportive classroom climate. Since teachers are not under pressure to complete the syllabi and students are given more time to understand and master each topic, many Normal students are able to enjoy some form of academic success. The success, although small, may be sufficient to perpetuate a positive upward spiral that enhances students' self-concept and sustains their motivation.

The provision of an extra year for lower-ability stream students is not common in other countries. In most cases, being streamed into a lower-ability stream only implies that the students are taught at a slower rate with no extra time given. Thus, lower-ability stream students learn less than their higher-ability stream counterparts, with the effect exacerbated over time. The system in Singapore, however, allows most students, regardless of stream, to work towards acquiring a GCE 'O' level certificate. This means that the streaming exercise does not limit the educational opportunities of the students. Consequently, the negative stream effects on educational aspirations and motivational level may be avoided. The equal opportunities also appear to minimise the stigmatising effect of being in the lower-ability stream. In the light of the situation, it is not surprising that Normal students have higher academic self-concept than their Express counterparts.

Since self-concept is essentially a product of social interactions (Cooley, 1912; Mead, 1934, see Section 2.1), it is relevant that the effect of streaming is contingent upon the attitudes of parents and teachers. If lower-ability stream students perceive their significant others of appraising them less favourably and expecting less of them, their academic self-concept will be undermined. As such, credits should be given to the teachers and parents of Normal students that such a negative impact of streaming was not felt.

From the other perspective, it is possible that streaming may have a long-term negative impact on higher-ability stream students' academic self-concept. While contrary to logic, there is evidence to suggest that some students, particularly girls, cannot adapt to the speed, pressure and competition in top classes (Boaler, 1997a, 1997b). The high-pressure environment causes a lot of stress and anxiety to these students, which leads to underachievement and low self-concept. Although there is no evidence in this study of a more pronounced stream effect on higher-ability stream girls, the Express students' responses suggest that their confidence could have suffered in the highly competitive environment. Specifically, they were more inclined than Normal students to agree that *they did poorly in tests,* and *their teachers felt that they were poor in their work.*

In conclusion, to answer **research question 1(c)(iii)** (Section 2.8), there is evidence to affirm that *there is significant difference between streams in students' academic self-concept, as a whole or in specific areas, in Secondary 1, 2 and 3.*

Subgroup comparisons of changes in students' academic self-concept over time

As noted in Section 4.1.3, many of the declines in the Normal students' academic self-concept scores were significantly less than that of the Express students.

The results suggest that it may be easier for lower-ability stream students to handle the pressure of adolescence than their higher-ability stream counterparts. The postulation is tenable since higher-ability stream students may have to cope with the added problems of high parental pressure for success, and a highly evaluative and competitive classroom environment.

In sum, to answer **research question 1(c)(iv)** (Section 2.8), there is sufficient evidence to establish that *there is significant difference between streams in the changes in students' academic self-concept, as a whole or in terms of specific areas, from Secondary 1 to Secondary 3.*

5.1.4 Lower Express and Higher Normal Students

Developmental changes in Lower Express and Higher Normal students' academic self-concept

It will be recalled that Lower Express students were students whose PSLE results were in the lowest third of the Express sample, whilst Higher Normal students were students whose PSLE results were in the highest third of the Normal sample (see Section 2.9). The Lower Express students were essentially the less academically inclined students in the higher-ability stream, whereas the Higher Normal students were the more academically inclined students in the lower-ability stream. However, it has to be emphasised that the Lower Express students had significantly higher

PSLE results and non-verbal reasoning test scores than the Higher Normal students (see Section 3.2.2).

As highlighted in Section 4.1.4, the developmental changes in Lower Express students' academic self-concept scores were not unlike that of the overall sample in that many of the scores decreased significantly over time. In contrast, the developmental changes in Higher Normal students' academic self-concept scores were less consistent with that of the overall sample. Although the declines for the overall 3-year period were significant for the scores of the academic self-concept scale and the students' effort subscale, most of the declines for the 1-year intervals were not significant.

Taken together, the overall declines documented for the two subgroups of students suggest that Lower Express and Higher Normal students go through similar periods of stress and adjustment like the majority of students. Nonetheless, there is evidence to suggest that Higher Normal students are able to cope relatively well with the pressure of adolescence. The finding is perhaps explicable by Marsh and Parker's (1984) BFLPE. Since Higher Normal students are effectively the 'big fishes in the little pond', it is conceivable that they remain largely confident of their academic abilities throughout early to middle adolescence. In addition, it is plausible that by virtue of their stream membership, the adjustment of Higher Normal students may be facilitated by less parental pressure for success, and a less evaluative and competitive classroom climate.

In conclusion, the overall declines over time affirm that for **research questions 1(d)(i) and 1(d)(ii)** (Section 2.8), *there are significant developmental changes in Lower Express and Higher Normal students' academic self-concepts, as wholes or in specific areas, from Secondary 1 to Secondary 3.* Specifically, Lower Express and Higher Normal students' academic self-concepts tend to decline over time.

Subgroup comparisons of students' academic self-concept

It will be recalled that the Lower Express students had significantly higher scores for the academic self-concept scale and students' effort subscale at $time_0$, and lower score for the students' confidence subscale at $time_3$ than the Higher Normal students.

Since none of the reviewed studies looked at similar marginal groups, it is not known whether the current findings are unique to the situation in Singapore. Nonetheless, these findings serve to reinforce an earlier contention that streaming may not have a long-term negative impact on the academic self-concept of lower-ability stream students.

The stream effects, in favour of Lower Express students, at the beginning of this study is probably explicable by the earlier explanation that being streamed into the Normal stream is a public acknowledgement of Higher Normal students' lack of academic ability. Thus, it is not surprising that they had undermined academic self-concept and lowered effort level than Lower Express students immediately after the streaming exercise. This contention is supported by the responses of the students at the beginning of this study. Most notably, Higher Normal students were more inclined than Lower Express students to disagree that *they were good in most of their school subjects, they paid attention to teachers during lessons*, and *they studied hard for their tests*. In addition, they were more disposed to agree that *they daydreamed a lot in class*. Taken together, the results provide further endorsement for Slavin's (1988) contention that streaming students into lower-ability streams can have a stigmatising effect, albeit for a short term, that lowers students' expectations for achievement.

The stream effect, in favour of Higher Normal students, at the end of this study can be rationalised similarly by reasons given in the earlier section. Amongst them, the

BFLPE (Marsh & Parker, 1984) is possibly most relevant in accounting for the differences between the marginal groups. Although Lower Express students may have higher abilities than Higher Normal students, as in this study (reflected by the students' PSLE results and non-verbal reasoning test scores), their reference group is more demanding than that of the Higher Normal students. With constant evaluation and feedback, Lower Express students will learn that they are basically the 'little fishes in a big pond', whilst Higher Normal students will realise that they are the 'big fishes in a little pond'. Thus, it is conceivable that Lower Express students may have lower confidence than their Higher Normal counterparts.

The BFLPE is substantiated in the present study by the students' responses. Interestingly, three years after being streamed, Higher Normal students were more inclined than Lower Express students to agree that *they were good in most of their school subjects*, and *they were able to follow their lessons easily.*

To summarise, there is clear evidence to establish that for **research question 1(d)(iii)** (Section 2.8), *there is significant difference between Lower Express and Higher Normal students in their academic self-concept, as a whole or in specific areas, in Secondary 1, 2 and 3.*

Subgroup comparisons of changes in students' academic self-concept over time

As noted in Section 4.1.4, many of the declines in the Higher Normal students' academic self-concept scores were significantly less than that of the Lower Express students.

The aforementioned results suggest that Lower Express students may have more difficulties coping with the pressure of adolescence than Higher Normal students. The postulation may be explained by the fact that Lower Express students, by virtue of their stream membership, may have to cope with the added problems of high parental pressure for success, and heavy emphasis on evaluation and academic achievement. In this case, the difficulty is probably compounded since Lower Express students are likely to be the less academically inclined students in the higher-ability stream classes. They may be captives at the bottom of their highly competitive classes with little or no chance of experiencing success, possibly having to struggle to follow the pace of lessons in their classes, and having to face daily reminders of their failures and shortcomings. In view of the situation, it is not surprising that the heavy demand of adolescence, coupled with the stress and anxiety of being in the Express stream, can have a negative impact on Lower Express students' academic self-concept.

Finally, to answer **research question 1(d)(iv)** (Section 2.8), *there is significant difference between Lower Express and Higher Normal students in the changes in their academic self-concept, as a whole or in terms of specific areas, from Secondary 1 to Secondary 3.*

5.1.5 Summary of Main Points

- Generally, students' academic self-concept declines from early to middle adolescence. The decline may be explained by changes associated with adolescence, particularly, changes in school environment.

- Despite having better academic results, female students may have lower confidence in their academic competence than male students. However, they tend to have comparable academic self-concept because of their high self-evaluation of academic effort. Their low academic confidence may be related to them attributing academic success to luck rather than ability. It may also be a reflection of a lack of sufficient reinforcement from their significant others.

Their high effort level may be explicable by their concern about being well-liked, and their willingness to please.

- Normal and Higher Normal students tend to have lower academic self-concept than their Express counterparts immediately after streaming. Nonetheless, they tend to have comparable, if not higher, academic self-concept than their Express counterparts three years after being streamed. Their low academic self-concept immediately after streaming may be rationalised by the stigmatising effect of being publicly labelled as less able. However, their relatively positive academic self-concept three years after being streamed highlights the powerful impact of the BFLPE. In addition, it appears to support the streaming policy of Singapore, particularly in its provision of an exit criterion and an additional year for the lower-ability stream students.

- Express and Lower Express students' academic self-concepts tend to decline more substantially than that of their Normal counterparts from Secondary 1 to Secondary 3. The results may reflect the difficulties faced by Express students in coping with the added problems of high parental pressure for success, and heavy emphasis on evaluation and academic achievements in the higher-ability stream. The problem is probably compounded for Lower Express students since they are typically 'little fishes in a big pond'.

5.2 Comparison of Students' Perception of Home Environment

Three broad categories of research questions pertaining to students' perception of home environment are discussed in this section. They are developmental changes over time, subgroup comparisons at each point in time, and subgroup comparisons of changes over time (see Section 2.8).

5.2.1 Overall Sample

Developmental changes in students' perceived home environment

It will be recalled the students' home environment scores were rather high. However, they declined significantly for the overall 3-year period and for all except one of the 1-year intervals.

The present findings are consistent with the overall picture established from the reviewed studies. For instance, the decline of the scores of the relationship with parents subscale mirrors that of Marsh et al. (1985), Marsh (1989) and Keltikangas (1990). Essentially, Marsh and colleagues reported that students' relationships with their parents decreased with age from early to middle adolescence. Likewise, Keltikangas established an almost significant negative age effect ($p<0.07$) on the scores of the home-parent subscale for the overall sample of age 12, 15 and 18 students in a 6-year follow-up study.

The documented decline in parent-adolescent relationships is not surprising considering the interplay of changes during adolescence. One of the most important one is adolescents' quest for independence, which involves both physical and psychological autonomy (Dacey & Kenny, 1997). The physical distancing is easily rationalised by the fact that young children are dependent on their parents for help on meeting basic needs and for companionship. As they grow older, they are able to manage more on their own, and are able to find companionship with friends. Thus, they tend to spend less time with their parents, and more time getting to know the world outside of home. The new experiences, together with cognitive changes that occur during adolescence, often lead to their questioning and even rejecting of parental ideas and values. This re-examination of their images of parents allows them to achieve more realistic pictures of their parents. At the same time, the development of their own ideas pushes them towards realising their psychological autonomy (Dacey & Kenny, 1997).

The adolescents' strive for physical and psychological autonomy means that the adolescent-parent relationships are different from that of the asymmetrical child-parent relationships of younger days. There will be a need for renegotiations of boundaries and mutual needs, which may lead to conflicts (Laursen, 1995). In cases where the adolescents' strive for autonomy outweighs or outpaces their parents' willingness to grant that freedom, the disagreements and arguments can be frequent. Even when the amount of conflicts does not justify a period of 'storm and stress', it is still a difficult time of adjustments for the adolescents and their parents.

In addition to the aforementioned, adolescents also experience physiological changes, and associated changes in their relationships with the opposite-sex. Specifically, they begin to relate more to friends of the opposite-sex as they enter mid-adolescence. Due to the intensity of these new relationships, they tend to take a strong interest in themselves, including their appearance and their thoughts (Blos, 1979). Their image to others become very important to them, often causing them to become self-absorbed and defensive to criticism (Blos, 1979). The adolescents' new interest in the opposite sex, their preoccupation with their image, and their self-defensiveness may not be well received by their parents, and they may be the cause of more conflicts.

The problems faced by adolescents and their parents are also complicated by the fact that the adolescents are undergoing cognitive changes. One important aspect of this is the emergent of egocentric thinking, that is, adolescents begin to 'think more about themselves, and watch themselves as though from above' (Dacey & Kenny, 1997, p. 114). They begin to think that they are unique, and that they are different from people around them. They cannot believe that anyone else, especially if the person is older or younger, or from a different race or gender could understand how they feel. Consequently, they may share less with their parents, leading to more distant adolescent-parent relationships.

Finally, from another perspective, adolescence may be a difficult period for parents since they may hold conflicting views towards their children. They may wish that their children are more independent to make their own decisions and to cease making demands. At the same time, they may be frightened of the consequences of granting them independence, for example, teenage pregnancy (Coleman & Hendry, 1990). Consequently, parents may be sending inconsistent messages to their young adolescents, which may exacerbate an already stressful relationship.

On the basis of the above discussion, it is easy to comprehend the reported decline in relationship with parents. In comparison, the documented decline of academic support appears less easy to explain. Considering the heavy emphasis on academic achievements in Singapore, parental academic support is expected to be maintained, if not increased, with increasing grade levels. It is especially true in this case since the students were preparing for the GCE 'O' or 'N' level examinations a year after the end of this study. The reason for this unexpected finding is not known but it is possible that the decline of academic support is more perceived than real. Perhaps in the face of intense evaluation and competition in secondary schools, adolescents want more support and encouragement from their parents. If their needs outweigh the increase in parental encouragement and support, they may conclude that there is a lack of parental support. Alternatively, adolescents, in their quest for autonomy, may not want to acknowledge that their parents still keep a close check on their academic work. They may be inclined to disagree that their parents tell them to study hard or make sure that they do their homework.

Nonetheless, it is possible that parents may have indeed given their children less support. Some parents may feel that their children are old enough to be responsible for themselves so there is no need to spend so much time with them on their academic work. They may choose to concentrate on their careers now that their children have grown up, or they may be busy with younger children. Since adolescents are striving for independence, it is also likely that some parents may decide to grant them autonomy to be responsible for their own academic work.

In the light of the above discussion, no firm conclusion can be made about declining parental academic support. In order to have a better understanding, there is a need for further study into the responses of adolescents and their parents.

To conclude, there is sufficient evidence to answer **research question 2(a)(i)** (Section 2.8). In this case, *there is significant developmental change in students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3.* Specifically, students' perception of home environment largely declines over time.

5.2.2 Male and Female Students

Developmental changes in male and female students' perceived home environment

As highlighted in Section 4.2.2, the developmental changes in male and female students' home environment scores were similar to that of the overall sample in that most of the scores declined significantly over time. However, it is noteworthy that the declines of the male students' home environment scores were not significant during the first 1-year interval.

The present results are comparable with that of Marsh et al. (1985) and Marsh (1989). Essentially, Marsh and colleagues reported linear declines in the scores of the parent relations subscales for male and female students during early to middle adolescence.

The declines in male and female students' perceptions of home environment are explicable in view of the changes highlighted in Section 5.2.1. In comparison, the non-significant declines in the home environment scores of the male students during Secondary 1 are less straightforward. Considering that male adolescents normally develop later and slower than female adolescents (Dacey & Kenny, 1997), the findings suggest that male adolescents may not have started their quest for autonomy in Secondary 1. With no negotiation of boundaries and less conflicts, it is tenable that male adolescents' perception of home environment remains largely favourable.

In sum, there is sufficient evidence to answer **research questions 2(b)(i) and 2(b)(ii)** (Section 2.8). That is, *there are significant developmental changes in male and female students' perceived home environment, as wholes or in specific areas, from Secondary 1 to Secondary 3*. Specifically, both genders' perceptions of home environment generally decline over time. However, the perception of male students appears to decline slightly later than that of female students.

Subgroup comparisons of students' perceived home environment

As noted in Section 4.2.2, although both genders had highly congruent scores for the academic support subscale, female students had significantly higher scores for the home environment scale and relationship with parents subscale at $time_0$ than the male students.

The results of the home environment subscales at $time_0$ are consistent with that of Liu's Secondary 1 sample (1994) but that of the home environment scale is not. Essentially, Liu documented a gender difference, in favour of female students, in the scores of the relationship with parents subscale, but no gender difference in the scores of the academic support subscale and home environment scale. Since the home environment scale was an aggregate of the relationship with parents subscale and academic support subscale, the disparities in findings merely reflect that the gender effect on the relationship with parents subscale in this study was more pronounced than that of the earlier study. It is noteworthy that Liu also established the same results in the sample of Secondary 4 students. Taken together with the results of the present study, the findings suggest that female students enjoy better relationships with their parents during early adolescence and late adolescence than their male counterparts.

The finding that female students report better relationships with parents is not unexpected since girls are normally more 'people-oriented' than boys (Rosenberg & Simmons, 1975). They are generally more anxious about promoting interpersonal harmony, more concerned about being well-liked, and more worried about avoiding behaviour that elicits negative reactions. In the light of these differences, it is tenable that girls work harder at relationships so it is conceivable that that they enjoy better relationships with their parents than boys. This contention is supported in the present study by the students' responses. In particular, female students tended to agree more than male students that their *parents liked to spend time with them.* They were also more likely to disagree that *they wanted to run away from home.* They were more inclined to disagree that their *parents were always scolding them,* and their *parents disliked them because they were not good enough.* They were also more disposed to disagree that their *parents did not trust them,* and their *parents thought that they were failures in school.*

To a large extent, the intuitive appeal of the aforementioned contention makes it inexplicable that the cordial relationships between female students and their parents were not sustained throughout adolescence. This is probably related to the socialisation experience of both genders during adolescence. Block (1973) reported that boys face fewer constraints than girls, and are given autonomy earlier. Based on the findings, girls may have more problems with their parents in their quest for physical and psychological autonomy than boys. In the context of the present study, it is tenable that the problems may be compounded since Asian parents are generally stricter and more protective of their daughters than their North American or European counterparts. Despite that, it should be noted that even at its lowest, female students' perceived relationships with parents were comparable with that of male students.

In line with the above contention, Liu's finding that Secondary 4 female students had more positive perception of relationships with parents than male students (as noted earlier) might be a reflection of some sort of rapprochement in newly defined adolescent-parent relationships.

Significantly, the present study failed to establish any gender effect on academic support from Secondary 1 to Secondary 3. The result provides strong endorsement that parents in Singapore give equal emphasis to their children's education regardless of their sex (as suggested in Section 5.1.2).

To conclude, in answer to **research question 2(b)(iii)** (Section 2.8), the results revealed that *there is significant difference between genders in students' perceived home environment, as a whole or in specific areas, in Secondary 1, 2 and 3.*

Subgroup comparisons of changes in students' perceived home environment over time

It will be recalled that the scores of female students' home environment scale and relationship with parents subscale decreased significantly more than that of male students for the first 1-year interval and the overall 3-year period.

The results of the relationship with parents subscale are inconsistent with that of Marsh et al. (1985) and Marsh (1989). Essentially, Marsh and colleagues reported comparable developmental declines in the scores of parents relations subscales of male and female students. Since male and female adolescents are socialised differently in different cultures, the disparities between the present results and that of the Australian studies (Marsh et al., 1985; Marsh, 1989) are comprehensible. The documented gender effects on the developmental patterns in the present study are likely to be reflections of male and female students' differential socialisation experience in Singapore. Essentially, the results suggest that adolescence girls in Singapore go through a more difficult time of adjustment during early to middle adolescence than their male counterparts.

To summarise, there is sufficient evidence to answer **research question 2(b)(iv)**, that is, *there is significant difference between genders in the changes in students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3.*

5.2.3 Express and Normal Students

Developmental changes in Express and Normal students' perceived home environment

As highlighted in Section 4.2.3, the developmental changes in Express and Normal students' home environment scores were similar to that of the overall sample in that most of the scores declined significantly over time. However, it is noteworthy that the declines of the Normal students' home environment scores were not significant during the first 1-year interval.

None of the reviewed studies explored stream effect on students' perception of home environment over time, so it is not known whether the results are unique to Singapore. Nevertheless, the declines of Express and Normal students' home environment scores can be rationalised by reasons mentioned for the overall sample. With regard to the non-significant declines of Normal students' home environment scores during the first 1-year interval, the findings may be explicable by the fact that being streamed into the lower-ability stream could have affected the students' relationships with their parents. They could have started Secondary 1 with poor perception of their home environment. In such view, it is tenable that the differences in their home environment scores were not significant during the first year of the study.

To conclude, for **research questions 2(c)(i) and 2(c)(ii)** (Section 2.8), the present results establish that *there are significant developmental changes in Express and Normal students' perceived home environment, as wholes or in specific areas, from Secondary 1 to Secondary 3.* Essentially, although Normal students' perception of home environment remains stable during Secondary 1, Express and Normal students' perceptions generally decline over time.

Subgroup comparisons of students' perceived home environment

Although the Normal students had slightly lower home environment scores than their Express counterparts at the start of the study, it will be recalled that there was no significant difference between streams in the students' home environment scores at any point in time during the 3-year period.

The present findings are inconsistent with that of Liu (1994), who reported significant stream effects, in favour of Express students, on the home environment scores of both samples of Secondary 1 and 4 students. There is no clear reason for the differences in findings of the two studies. As noted in Section 5.1.3, there were similar inconsistencies between the present study and Liu (1994) for older adolescents' academic self-concept scores. Taken together, the findings reinforced the earlier speculation that the implementation of the streaming policy may have become more successful in recent years. Presumably, if students and their parents realise the beneficial effects of streaming, then being a Normal student is no longer a stigma. In such a situation, there is no reason to expect any stream effect on students' relationship with parents or parental academic support.

To conclude, in answer to **research question 2(c)(iii)** (Section 2.8), *there is no significant difference between streams in students' perceived home environment, as a whole or in specific areas, in Secondary 1, 2 and 3.*

Subgroup comparisons of changes in students' perceived home environment over time

As noted in Section 4.2.3, the scores of the Express students' home environment scale and academic support subscale declined significantly more than that of the Normal students for the overall 3-year period.

The aforementioned results may be related in part to the low home environment scores of the Normal students at the start of the study. However, they may also be reflections of greater parental pressure on Express students to achieve academic success. Presumably, parents can be critical of poor performance in their eagerness for their children to achieve success. Hence, as compared to Normal students, Express students may feel that their parents are not supportive of them.

In sum, for **research question 2(c)(iv)** (Section 2.8), there is significant difference between streams in the changes in students' perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3.

5.2.4 Lower Express and Higher Normal Students

Developmental changes in Lower Express and Higher Normal students' perceived home environment

It will be recalled that the developmental changes in Lower Express students' home environment scores were not unlike that of the overall sample in that the scores declined over time. However, the declines were mostly not significant for the first and last 1-year intervals of the study. In comparison, the developmental changes in Higher Normal students' home environment scores were less consistent with that of the overall sample in that the scores actually increased during the first 1-year interval of the study. Nonetheless, similar to that of the Lower Express students, the changes in the home environment scores were not significant for the first and last 1-year intervals of the study.

To a large extent, the initial non-significant changes in students' perception of home environment may be rationalised by the streaming process per se. Presumably, Lower Express students were probably not the most academically inclined students in their primary schools. Thus, the students and their parents may have been pleasantly surprised by the outcome of the streaming process. The excitement of being in the higher-ability stream, couple with new hopes and motivation at the beginning of Secondary 1 may have initiated positive cycles that led to better adolescent-parent relationships and improved parental academic support. In this view, it is tenable that the positive effect of being in the Express stream may have countervailed the negative age effects reported for the Express students, resulting in the current non-significant declines.

In line with the aforementioned explanation, Higher Normal students, on the other hand, were possibly not the least academically inclined students in their primary schools. Thus, they and their parents may have been devastated by the outcome of the streaming process. The initial shock and disappointment may have affected adolescent-parent relationships and parental academic support, leading to Higher Normal students having negative perception of their home environment. However, it is tenable that the situation improves after the initial period so that Higher Normal students' perception of their home environment becomes more positive, although not significantly, at the end of the year.

However, the positive effect of stream membership on Lower Express students cannot be sustained without academic success. Since these students are possibly the weakest students in their homogeneous classes, such successes are likely to be infrequent. Eventually, the students and their parents may realise that they are the 'little fishes in the big pond'. The realisation is bound to be painful and may strain parent-adolescent relationships. Hence, it is not surprising that the study documented the largest declines in Lower Express students' home environment scores during Secondary 2. However, it is tenable that once parents have accepted the limitations of their children, cordial parent-adolescent relationships can be restored. Incidentally, the rapprochement in Lower Express students' perception of home environment in the third year of the study suggests such a reconciliation.

Likewise the negative effect of stream membership on Higher Normal students is not permanent. Eventually, Higher Normal students and their parents will reach rapprochement in the realisation that they are effectively the 'big fishes in the little pond'. Despite their stream membership, Higher Normal students' experience of academic success is likely to perpetuate a positive upward spiral that leads to greater motivation and higher academic self-concept. In view of the positive cycle, coupled with the realistic chance of being transferred to the Express stream, Higher Normal students should enjoy high parental regard and strong academic support over the years. It is therefore not surprising that the positive influences can countervail the negative age effects reported for the bigger group of Normal students, resulting in the non-significant declines documented at the end of the study.

To conclude, for **research questions 2(d)(i) and 2(d)(ii)** (Section 2.8), the present results are able to affirm that *there are significant developmental changes in Lower Express and Higher Normal students' perceived home environment, as wholes or in specific areas, from Secondary 1 to Secondary 3.* Essentially, although Lower Express and Higher Normal students' perceptions of home environment tend to remain stable during Secondary 1 and 3, they decline over the first three years of secondary education.

Subgroup comparisons of students' perceived home environment

It will be recalled that the Higher Normal students had significantly lower scores for the relationship with parents subscale at time$_0$ than the Lower Express students.

The aforementioned result demonstrates that being streamed into the lower-ability stream can have a negative impact, albeit for a short term, on parent-adolescent relationships. This is hardly surprising considering that most parents put a lot of emphasis on academic achievement (Burns, 1982). Thus some parents may be angry or even embarrassed by the lack of achievement of their children. Such an immediate negative stream effect on adolescent-parent relationship is supported in the present study by the students' responses. Interestingly, at the beginning of the study, Higher Normal students were more inclined than Lower Express students to agree that *there were many times when they would like to run away from home.*

Nonetheless, it is heartening to see that the negative impact disappeared by the end of Secondary 1. Considering that the home environment is a probable deterministic factor of students' motivation level, and a possible limiting factor in their level of self-concept, the turnabout of the parent-adolescent relationship is undoubtedly poignant.

To conclude, the evidence reveals that for **research question 2(d)(iii)** (Section 2.8), *there is significant difference between Lower Express and Higher Normal students in their perceived home environment, as a whole or in specific areas, in Secondary 1, 2 and 3.*

Subgroup comparisons of changes in students' perceived home environment over time

As noted in Section 4.2.4, the scores of the Lower Express students' home environment scale decreased significantly more than that of the Higher Normal students for the first 1-year interval and the overall 3-year period. Likewise, the scores of their academic support subscale decreased significantly more for the first 1-year interval.

The results painted a more promising picture for Higher Normal students than Lower Express students. It appears that in the long run, being high achievers in the Normal stream not only enhance the way adolescents feel about themselves (see Section 5.1.4). They also influence the way they interact with their parents, the amount of academic support they get, and their overall perception of their home environment. Taken together, the results provide strong endorsement for Marsh and Parker's (1984) BFLPE. In this case, 'it is better to be a big fish in a little pond than a little fish in a big pond'.

In sum, the evidence demonstrates that for **research question 2(d)(iv)** (Section 2.8), *there is significant difference between Lower Express and Higher Normal students in the changes in their perceived home environment, as a whole or in specific areas, from Secondary 1 to Secondary 3.*

5.2.5 Summary of Main Points

- Generally, students' perception of home environment declines from early to middle adolescence. The decline is possibly associated with adolescents' strive for physical and psychological autonomy, changes in their relationships with the opposite-sex, and emergent of egocentric thinking. Alternatively, it may reflect that the adolescence period is also a difficult time for parents. Parents may hold conflicting views about their adolescence children, which may exacerbate an already stressful relationship.

- Male students' perception of home environment appears to decline slightly later than that of female students. The finding suggests that male students may start their quest for autonomy later than their female counterparts.

- During early adolescence, female students tend to have more positive perceptions of their home environment and their relationship with parents than male students. However, their positive perceptions tend to decline more substantially than that of their male counterparts from early to middle adolescence. The gender effect, in favour of female students, during early adolescence may be related to female students being more 'people-oriented'. The absence of subsequent gender effect, and the more pronounced developmental declines may be related to differential socialisation experiences in their strive for autonomy. The problem may be compounded in Singapore because Asian parents are generally stricter with their daughters than their North American and European counterparts.

- Normal students', Higher Normal students' and Lower Express students' perceptions of home environment tend not to change substantially during the first year of secondary education. Higher Normal students also tend to have less cordial relationship with parents immediately after streaming than their Lower Express counterparts. The results suggest that streaming can have an immediate impact on adolescent-parent relationships. However, the stream effects appear to be temporary.

- Lower Express and Higher Normal students' perceptions of home environment tend to remain stable in the third year after being streamed. The findings suggest that students' relationships with parents may have reached some sort of rapprochement regardless of their stream membership.

- Express and Lower Express students' perceptions of home environment and the level of parental academic support tend to decline more substantially than their Normal counterparts from Secondary 1 to Secondary 3. These results may be attributed in part to a high parental pressure for success and heavier emphasis on academic achievements in the Express stream, leading to parents being overly critical of their children's academic performance. This problem is probably compounded for Lower Express students because they are often the 'little fishes in a big pond'.

5.3 Comparison of Students' Perception of Classroom Climate

Three broad categories of research questions pertaining to students' perception of classroom climate are discussed in this section. They are developmental changes over time, subgroup comparisons at each point in time, and subgroup comparisons of changes over time (see Section 2.8).

5.3.1 Overall Sample

Developmental changes in students' perceived classroom climate

As noted in Section 4.3.1, the students' classroom climate scores were quite high, but they declined significantly for the overall 3-year period and for most of the first and second 1-year intervals. The exception was the scores of the peer relationship subscale, which recorded a significant increase in the last 1-year interval of the study.

The documented decline in relationship with teachers is in contrast to findings by Furman and Buhrmester (1992) in America. Although the earlier study established negative age effects from Grade 4 to Grade 7, and Grade 4 to Grade 10 on students' perception of support from teachers, the difference between Grade 7 and Grade 10 was not significant. The reason for the inconsistencies in findings is not known. It is possible that they are merely reflections of the different classroom situations in America and Singapore.

Despite not being replicated in other studies, the negative age effect on perceived relationship with teachers can be rationalised by the fact that younger children often treat teachers as secondary attachment figures who help to fulfil their needs for nurturance and assistance (Tinsley & Parke, 1984). However, as children grow older, the importance of these relationships diminishes when others, such as friends, can often meet their needs better (Tinsley & Parke, 1984).

Eccles and Midley (1988, 1990) reported that teacher-student relationships become more impersonal in junior high school environment. In line with their findings, the decline in perceived relationship with teachers, especially during Secondary 1, may also be explained by the effect of transition from primary to secondary schools. In secondary schools, students are faced with more teachers than in primary schools. However, most teachers see them only for a few periods each week, and generally spend less time interacting with them than their primary school teachers. Thus, it should be no surprise that students may feel less positively about student-teacher relationships at the end of Secondary 1 than they had at the beginning of the year.

It will be recalled that the decline in perceived relationship with teachers was sustained in the second year of this study. This finding is perhaps explicable by the fact that students are channelled internally at the end of Secondary 2 into different courses, such as science, technical, commerce or art. Due to the internal streaming process at the end of the year, teachers may focus their time and energy on meeting lesson objectives and achieving academic success. In such a situation, conceivably, there may be less time available for interactions and building of personal relationships.

Likewise, the documented decline in teachers' expectations, especially during Secondary 1, can be attributed to the transition from primary to secondary schools. Presumably, larger reference groups in secondary schools may make it difficult for students to establish themselves academically. With fewer chances of academic success, coupled with a larger social comparison group, less attention from teachers, and added pressure of coping with more subjects, it is tenable that students may feel that their teachers do not think highly of their academic competence.

After the initial transition period, however, students have to face the pressure of internal streaming and its associated problems of heightened emphasis on competitions and grades (Eccles & Midley, 1988, 1990). Since teachers are the salient perpetuators of the evaluative and competitive environment, the constant reminders of failure and frequent negative feedback may reinforce the students' initial beliefs that their teachers do not hold very high expectations of their academic competence. Considering that teachers' expectations are votes of confidence in students' academic competence and abilities (Burns, 1982), the perceived decline is an issue that has to be addressed.

Although the results established significant declines in perceived relationship with teachers and teachers' expectations for the overall 3-year period, as well as for the first and second years of the study, it is heartening to note that the declines were not significant in the last year of the study. Perhaps finally, without the added pressure of the internal streaming process, the students were able to settle into the less personal and more evaluative secondary school environments.

With regard to the peer relationship subscale, the results revealed that the developmental trend was a U-shaped pattern, with Secondary 2 students recording the lowest mean. The initial decline may again be explained in part by the transition from primary to secondary schools. Considering that students face huge challenges of establishing themselves and finding their own niches in secondary schools, it is tenable that perceived peer relationships should decline initially. However, once the students have settled down and are more confident of themselves, their perception of peer relationships should become progressively more positive, especially since there is an increase in the importance of friendships during adolescence (Juhasz, 1989b).

To conclude, for **research question 3(a)(i)** (Section 2.8), the results establish that *there is significant developmental change in students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3.* Specifically, students' perception of classroom climate largely declines over time, although there appears to be rapprochement in Secondary 3.

5.3.2 Male and Female Students

Developmental changes in male and female students' perceived classroom climate

It will be recalled that the developmental changes in male and female students' classroom climate scores were similar to that of the overall sample. Essentially, the scores declined significantly for the overall 3-year period and for most of the first and second 1-year intervals.

Due to the developmental nature of this study and the age range studied, the present results are not directly comparable with that of Liu (1994), Furman and Buhrmester (1992), and Ryan et al. (1994). Nevertheless, the developmental changes in male and female students' perceptions of classroom climate can be explained by reasons highlighted in the earlier section for the overall sample.

In summary, for **research questions 3(b)(i) and 3(b)(ii)** (Section 2.8), the findings established that *there are significant developmental changes in male and female students' perceived classroom climate, as wholes or in specific areas, from Secondary 1 to Secondary 3.* Specifically, male and female students' perceptions of classroom climate largely decline over time, although there appears to be rapprochement in Secondary 3.

Subgroup comparisons of students' perceived classroom climate

As noted in Section 4.3.2, the female students had significantly higher peer relationship scores at $time_0$, $time_2$ and $time_3$ than the male students.

The gender effects on peer relationship are consistent with findings by Furman and Buhrmester (1992), and Ryan et al. (1994), but are in contrast to Liu (1994). Specifically, Liu (1994) failed to establish gender effects on the scores of the peer relationship subscale for both subgroups of Secondary 1 and 4 students. The reason for the inconsistencies in findings is not known.

Nonetheless, the current finding is not surprising since girls generally invest more emotionally, and have a greater level of closeness than boys (Savin-Williams & Berndt, 1990). Moreover, there is evidence to suggest that girls' perception of friendships may be qualitatively more positive than boys in the level of support and intimacy (Claes, 1998; Furman & Buhrmester, 1992; Ryan et al., 1994). The contention for such a qualitative difference between genders is supported by the students' responses in the present study. Notably, female students were more inclined than the male students to agree that *they showed care and concern for their classmates who had problems*, and *they helped one another with their homework.*

In addition to the aforementioned, the students' responses revealed that female students were more inclined to agree that they *respected their monitors and co-operated with them.* They were also more disposed to disagree that their *classmates quarrelled among themselves,* and that it took them a *long time to get to know everyone by their names.* Some of the female students' responses may be socially desirable responses, and they appear to support Rosenberg and Simmons' (1975) conclusion that adolescence girls are more 'people-oriented'. That is, relative to boys, they are more willing to please people and more concern about promoting personal harmony.

The absence of a gender effect on the relationship with teachers and teachers' expectations scores suggests that female students do not perceive any discriminations in school, particularly, in terms of teachers' beliefs in their academic competence and abilities. Thus, the result validates an earlier contention that comparable support and guidance are given to both genders in schools (see Section 5.1.2).

To conclude, for **research question 3(b)(iii)** (Section 2.8), there is evidence to affirm that *there is significant difference between genders in students' perceived classroom climate, as a whole or in specific areas, in Secondary 1, 2 and 3.*

Subgroup comparisons of changes in students' perceived classroom climate over time

It will be recalled that there was no significant difference between genders in the changes in students' classroom climate scores over time. The finding is not surprising since male and female students face similar difficulties in adjusting to their secondary school environment, and in coping with the heightened emphasis on competition and grades.

In conclusion, for **research question 3(b)(iv)** (Section 2.8), the present study establishes that *there is no significant difference between genders in the changes in students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3.*

5.3.3 Express and Normal Students

Developmental changes in Express and Normal students' perceived classroom climate

As noted in Section 4.3.3, the developmental changes in Express students' classroom climate scores were similar to that of the overall sample in that the scores declined significantly for the overall 3-year period and for most of the first and second 1-year intervals. However, the developmental changes in Normal students' classroom climate scores were less consistent with that of the overall sample. Essentially, the declines in the scores of the relationship with teachers and teachers' expectations subscales for the first 1-year interval, and all the changes in the scores of the peer relationship subscale over the 3-year period were not significant. In addition, most of the classroom climate scores actually increased, although not significantly, during the last 1-year interval of the study.

The negative age effects on the classroom climate scores of the Express and Normal students may be explicable by reasons mentioned for the overall sample, such as the effects of transition from primary to secondary schools and internal streaming at the end of Secondary 2 (refer to Section 5.3.1).

With regard to the initial non-significant declines of the Normal students' classroom climate scores, the results may be explained in part by the streaming process per se. Conceivably, being streamed into the lower-ability stream may have affected Normal students' attitudes towards school such that they have predisposed negative perceptions of their teachers and classmates at the beginning of Secondary 1. In line with such a contention, it is conceivable that the differences in the students' perceptions of classroom climate at the beginning and end of the year did not reach statistical significance.

From another perspective, the initial non-significant declines in Normal students' classroom climate scores, and the non-significant changes in the scores of the peer relationship subscale suggest that the Normal stream classroom climate may be more conducive for the development of personal relationships than the Express stream classroom climate. Presumably, the less competitive and slower pace environment in Normal stream classes may have allowed students more time to interact with their teachers and classmates than that of Express stream classes.

In summary, for **research questions 3(c)(i) and 3c(ii)** (Section 2.8), the results affirm that *there are significant developmental changes in Express and Normal students' perceived classroom climate, as wholes or in specific areas, from Secondary 1 to Secondary 3.* Specifically, although Normal students' perception tends not to decline in Secondary 1, and Express and Normal students' perceptions tend to remain fairly stable in Secondary 3, their perceptions generally decline over time for the first three years of secondary education.

Subgroup comparisons of students' perceived classroom climate

It will be recalled that Express students had significantly higher scores for the classroom climate scale and subscales at $time_0$ than the Normal students. In contrast, the Normal students had significantly higher scores for the relationship with teachers subscales at $time_1$ and $time_3$ than the Express students.

The initial stream effects, in favour of higher-ability stream students, on the classroom climate scores are consistent with that of Hargreaves (1967), Ball (1981), Oakes (1982, 1985), Vanfossen et al. (1987) and Liu (1994). In essence, the reviewed studies reported that lower-ability stream students had less positive perceptions of relationships with teachers and peers, and teachers' expectations of academic abilities than higher-ability stream students.

The aforementioned findings substantiate the earlier postulation that being streamed into the lower-ability stream may have resulted in Normal students having a predisposed negative attitudes towards teachers and peers. Besides the negative impact of the streaming process per se, it is difficult to rationalise the differential perceptions of the Express and Normal students during the first week of Secondary 1, especially since most classes share the same teachers.

The contention of the Normal students having predisposed negative attitudes at the beginning of Secondary 1 is supported by the students' responses in the questionnaire. In essence, Normal students were more inclined than Express students to agree that their *teachers were only interested in the clever students in their classes*. Considering the short time frame, the students' perception is not likely to be accurate. Teachers may not have the time to get to know all their students, so it is unlikely that they can identify the clever ones. Without further evidence, it can only be speculated that being streamed into the Normal stream may have affected students' sense of self-worth, that in turn has resulted in them interpreting the less personal student-teacher relationships in secondary schools as rejections.

The students' responses also revealed that Normal students were more disposed than the Express students to agree that their *teachers felt that their class was stupid*, and *their teachers did not care whether they received low marks for their examinations*. In addition, they were more inclined to disagree that their *teachers believed they could pass their 'O' level examination if they worked hard*, and their *teachers stressed the importance of doing well in examinations*. Although the Normal students may be less academically inclined than Express students, it is unlikely that teachers would hold such negative expectations of the Normal students since most of them would do well in their national examinations. In fact, the results of the schools involved in this study showed that about 80% of their Normal students do well enough to proceed to Secondary 5, and about 85% of those in Secondary 5 achieve passes in at least 3 GCE 'O' level subjects (The Straits Times, 16 August 1997). In such view, Normal students' negative perception may have stemmed more from their own feeling of failure and dejection than the actual feedback they receive from their teachers.

With regard to the students' responses in the peer relationship subscale, Normal students were more inclined than Express students to agree that *their classmates often quarrelled among themselves*, and *there were groups of students who could not get along in their class.* Although the students' responses are consistent with that of reviewed studies, it has to be cautioned that the feedback was given after the first week of term. It is possible that the Normal students indeed quarrelled more often among themselves, and had more problems getting along in class than the Express students. However, the short time frame suggests that the Normal students' perception, whether accurate or otherwise, could have been influenced largely by a predisposed negative attitude towards their classmates.

The finding that Normal students had better relationships with teachers than Express students at $time_1$ and $time_3$ is inconsistent with that of Liu (1994). In essence, the earlier study documented that Express students had significantly higher classroom climate scores than the Normal students for both subgroups of Secondary 1 and 4 students. Whilst Liu's results of Secondary 1 students are similar to that of the Secondary 1 students at the start of this study ($time_0$), her results of Secondary 4 students are different from that of the current Secondary 3 students ($time_3$). The inconsistencies in findings for the older adolescents appear to substantiate the contention that streaming may have been implemented more successfully in recent years, thus resulting in negligible, or reversed, long-term stream effects on students' academic self-concept, and their perceptions of home environment and classroom climate.

The reversed stream effects in the later stage of the current study may be explained by the earlier rationale that less intensive curricula and slower pace of teaching in Normal stream classes may have allowed teachers more time to interact with students. The explanation is supported in the present study by the students' responses in the questionnaire. Notably, Normal students were more inclined than Express students to agree that *their teachers gave extra lessons to the weaker students*, and *their teachers enjoyed mixing with them at school functions*.

In sum, for **research question 3(c)(iii)** (Section 2.8), the results revealed that *there is significant difference between streams in students' perceived classroom climate, as a whole or in specific areas, in Secondary 1, 2 and 3.*

Subgroup comparisons of changes in students' perceived classroom climate over time

As noted in Section 4.3.3, the Express students' classroom climate scores declined significantly more than that of the Normal students for the first 1-year interval and the overall 3-year period.

The aforementioned findings may be explained in part by the significantly lower classroom climate scores of the Normal students at the beginning of Secondary 1. However, the results also suggest that Normal students' classroom climate is perhaps less detrimental to the erosion of perceived teachers' expectations, and more conducive to the building of student-teacher and student-peer relationships than that of the Express students.

The heightened emphasis on competition and grades in higher-ability stream classes may have encouraged teachers to 'challenge' students to achieve greater success, perhaps by reminding them constantly of their shortcomings and failures. In such a situation, it is conceivable that Express students' perception of teachers' expectations may decline more substantially than that of their lower-ability stream counterparts. In addition, the intensive curricula and fast pace teaching in Express stream classes may have inhibited the building of more personal student-teacher relationships, thus contributing to a more pronounced decline in perceived relationship with teachers than that in Normal streamed classes. At the same time, the competitive and evaluative environment may also be detrimental to the development of student-peer relationships. Competition in small amount may be beneficial as it can serve to motivate the students. However, if present in excessive quantity, it may cause stress and anxiety, and may create dissonance amongst classmates who may be less willing to help one another.

To conclude, for **research question 3(c)(iv)** (Section 2.8), the results affirm that *there is significant difference between streams in the changes in students' perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary 3.*

5.3.4 Lower Express and Higher Normal Students

Developmental changes in Lower Express and Higher Normal students' perceived classroom climate

As highlighted in Section 4.3.4, the developmental changes in Lower Express students' classroom climate scores were similar to that of the overall sample in that the scores declined significantly for the overall 3-year period and for most of the first and second 1-year intervals. However, the developmental changes in the Higher Normal students' classroom climate scores were unlike that of the overall sample. Nonetheless, they were similar to that of the Normal students in that the declines of the scores for the first 1-year interval, and all the changes in the scores of the peer relationship subscale over the 3-year period were not significant. In addition, the classroom climate scores increased, although not significantly, during the last 1-year interval of the study.

The negative age effects on the classroom climate scores of the Lower Express and Higher Normal students may be explained by reasons mentioned for the overall sample, such as the effects of transition from primary to secondary schools and internal streaming at the end of Secondary 2 (refer to Section 5.3.1).

With regard to the initial non-significant declines of the Higher Normal students' classroom climate scores, the results were comparable with that of the bigger group of Normal students so they may be explicable by reasons suggested earlier. In essence, they may be attributed to the negative impact of streaming per se, and the slower pace and less competitive environment of Normal stream classes.

In terms of the Higher Normal students' non-significant increases during the last year of the study, the findings may be related to the fact that Higher Normal students are probably the 'big fishes in the little pond'. The experience of academic success is likely to motivate them to work harder, perpetuating a positive upward spiral in their pursue of academic achievement. As such, it is not surprising that Higher Normal students' should have more favourable perceptions of relationships with teachers and teachers' expectations than they did during the period of internal streaming (Secondary 2).

It is noteworthy that none of the changes in Higher Normal students' peer relationship scores was significant. The finding was similar to that of the bigger group of Normal students, thus affirming the earlier contention that the less intensive and slower pace environment in Normal stream classes may have facilitated the building of student-peer relationships.

To conclude, for **research questions 3(d)(i) and 3(d)(ii)** (Section 2.8), the changes in the classroom climate scores for the overall 3-year period affirm that *there are significant developmental changes in Lower Express and Higher Normal students' perceived classroom climate, as wholes or in specific areas, from Secondary 1 to Secondary 3.* Specifically, although Higher Normal students' perception tends not to decline in Secondary 1, and Lower Express and Higher Normal students' perceptions tend to remain fairly stable in Secondary 3, their perceptions generally decline over time for the first three years of secondary education.

Subgroup comparisons of students' perceived classroom climate

It will be recalled that the Lower Express students had significantly higher classroom climate scores at $time_0$ than the Higher Normal students.

The initial negative stream effects reinforced the earlier postulation that streaming per se may have a devastating impact, albeit for a short-term, on students' perception of classroom climate. This explanation is supported by the students' responses at the beginning of Secondary 1. Amongst the many differences, Higher Normal students were more inclined than the Lower Express students to disagree that *their teachers tried to get to know them.* They were also more disposed to agree that *their teachers were only interested in the clever students in their class.* The irony is that the Higher Normal students were likely to be the clever students in the class. Thus, if their perception was accurate, instead of complaining that their teachers were not interested in getting to know them, they should be enjoying the attention of the teachers. The fact that the Higher Normal students had such negative perception of student-teacher relationships, as compared to Lower Express students, appears to support the contention that being streamed into the lower-ability stream may have affected the students' sense of self-worth.

The students' responses also revealed that Higher Normal students were more inclined than Lower Express students to agree that *their teachers felt that their class was stupid.* They were also more disposed to disagree *that their teachers believed they could pass their 'O' level if they worked hard.* As highlighted earlier for the Normal students, it is improbable that teachers would hold such negative expectations of their students, especially since many of the Higher Normal students would be among the 85% that would achieve passes in at least 3 'O' level subjects (The Straits Times, 16 August 1997). Thus, the students' responses suggest that Higher Normal students' negative perception at the beginning of Secondary 1 may stem more from their own feeling of failure and dejection of being in the Normal stream than the actual feedback they receive from their teachers.

With regard to the students' responses to the peer relationship subscale, the Higher Normal students were more inclined than the Lower Express students to agree that *there were groups of students who could not get along in class,* and that *some classmates often quarrelled among themselves.* In addition, they were more disposed to disagree that *they showed care and concern for their classmates who had problems*, and they *respected their monitors and co-operated with them.* As a whole, the result established a bleak picture of classroom dissonance. In view of the short time frame, the responses provide further support that students' perception of peer relationship immediately after being streamed may be moderated by predisposed negative attitude towards their classmates.

To conclude, for **research questions 3(d)(iii)** (Section 2.8), there is evidence to establish that *there is significant difference between Lower Express and Higher Normal students in their perceived classroom climate, as a whole or in specific areas, in Secondary 1, 2 and 3.*

Subgroup comparisons of changes in students' perceived classroom climate over time

As noted in Section 4.3.4, most of the Lower Express students' classroom climate scores declined significantly more than that of the Higher Normal students for the first 1-year interval and the overall 3-year period.

The results may be explained in part by the largely negative perception of the Higher Normal students at the beginning of Secondary 1. However, the differences in developmental changes between the two subgroups of students reiterate the contention that the Normal stream classroom climate may be more conducive to the development of personal relationships than the Express stream classroom climate.

In summary, for **research questions 3(d)(iv)** (Section 2.8), *there is significant difference between Lower Express and Higher Normal students in the changes in their perceived classroom climate, as a whole or in specific areas, from Secondary 1 to Secondary* 3.

5.3.5 Summary of Main Points

- Generally, students' perception of classroom climate declines from early to middle adolescence, although there appears to be rapprochement during the third year of secondary education. The declines are possibly related to the effects of transition from primary to secondary schools and internal streaming at the end of Secondary 2.

- Female students tend to have more positive perception of relationships with peers than male students. The finding suggests that female students' perception of friendships may be qualitatively more positive than male students, especially in the level of support and intimacy.

- Normal and Higher Normal students' perceptions of classroom climate tend not to decline during the first year after streaming. This finding suggests that the students may have started secondary schools with a predisposed negative attitudes towards their teachers and classmates, perhaps stemmed from a feeling of disappointment, failure and dejection of being in the lower-ability stream. From another perspective, the results may be related to the less intensive and slower pace environment of Normal stream classes, which allows students time to interact with their teachers and classmates.

- Normal and Higher Normal students tend to have less positive perceptions of classroom climate than their Express counterparts immediately after streaming. However, subsequently, Normal students tend to have more positive perception of relationship with teachers than Express students. The students' initial perception may be related to the aforementioned reason of predisposed negative attitudes towards teachers and classmates. Their subsequent more positive perception suggests that the less intensive and slower pace environment of the Normal stream classes may be more conducive to the building of student-teacher relationships than that of Express stream classes.

- Express and Lower Express students' perceptions of classroom climate tend to decline more substantially than that of their Normal counterparts during Secondary 1, and from Secondary 1 to Secondary 3. The results are again explicable by the aforementioned reasons of predisposed negative attitudes, and the more intensive and faster pace environment of the Express stream classes.

5.4 Relationships between Students' Academic Self-Concept and their Perceived Home Environment and Classroom Climate

Two broad categories of research questions are discussed in this section. They are relationships between students' academic self-concept and their perceived home environment and classroom climate, and subgroup comparisons by gender, ability stream and marginal ability stream of the relationships (see Section 2.8).

5.4.1 Overall Sample

As noted in Chapter 4.4.1, moderate and significant relationships were established between the students' academic self-concept scores and their home environment scores ($0.34 \leq r \leq 0.58$).

The aforementioned results are consistent with that of many reviewed studies. In essence, Liu (1994) reported positive and significant relationships between the score of the academic self-concept scale and the scores of the home environment variables, namely, home environment scale ($r = 0.42$), relationship with parents subscale ($r = 0.39$) and academic support subscale ($r = 0.39$). The study also established comparable relationships between the scores of the academic self-concept subscales, namely, students' confidence subscale ($0.29 \leq r \leq 0.33$) and students' effort subscale ($0.36 \leq r \leq 0.40$), and the scores of the home environment variables. Lau and Leung (1992), and Leung and Leung (1992) documented similar findings for the relationships between students' academic self-concept and relation with parents ($r = 0.27$ and $r = 0.27$ respectively). Quek (1988) and Sanders (1996) established consistent findings for the relationships between students' academic self-concept and academic support ($r = 0.18$ and $r = 0.229$ respectively).

Although the results are comparable, it is apparent that the correlations of reviewed studies are weaker than that of the current study. However, Lau and Leung's (1992), and Leung and Leung's (1992) data were based on students in Hong Kong, whilst Sanders' (1996) data were based on African American adolescents. Since the type of bond that adolescents have with their families varies considerably between cultures (Ladd, 1992), the disparities in the strength of the relationships may be reflections of variations that surround family life in different cultural contexts. Although Quek's (1988) study was also based on Singaporean students, the weaker correlations may be attributed to the use of schools with very different characteristics, ranging from government to mission schools, coeducational and single-sex schools. Indeed, further analyses of Quek's data revealed substantial differences between schools in terms of students' academic support scores ($2.23 \leq \text{mean} \leq 3.47$), and in the relationships between the scores of students' academic self-concept scale and the scores of academic support scale. Specifically, the relationship was significant in only two out of the nine schools involved in the study ($r = 0.39$, $p<0.01$ and $r = 0.36$, $p<0.01$).

The interpretation of Liu's (1994) results is not complicated by the use of diverse school sample since the study included only coeducational, government schools. However, Liu's overall sample was made up of Secondary 1 and 4 students. When the two grade levels of students were examined independently, it was found that the relationships for the Secondary 4 students were weaker than that of the Secondary 1 students. In view of the weaker correlations for the Secondary 4 students, it is not surprising that the correlations of Liu's overall sample are slightly weaker than that of the present study.

Despite slight variations in the strength of the relationships, there is clear evidence that there is a positive association between students' academic self-concept and their perception of home environment, particularly, their relationships with parents and parental academic support. The findings are easily rationalised by the fact that parents are among the most important people in the world of adolescents (Juhasz, 1989a, 1989b; Juhasz & Yue, 1989; Lempers & Clark-Lempers, 1992). When parents show affection for their sons and daughters, spend time with them and express approval of them, they convey to their adolescents strong messages concerning their inherent self-worth (Gecas & Schwalbe, 1986). With a positive sense of self-worth, it is tenable that adolescents will develop a healthy level of self-confidence, academically or otherwise. Presumably, if adolescents enjoy close and loving relationships with their parents, they will also strive to make their parents proud of them. Since parents generally put a lot of emphasis on academic achievement (Burns, 1982), the adolescents may work hard to achieve academic success. In such view, it is not surprising that perceived relationship with parents should be related to students' self-evaluation of academic competence.

From another perspective, students are believed to be cognitively appraising their competence during early adolescence (Harter, 1990), so adolescents may see parental academic support as an endorsement of their academic abilities. Considering that students' self-evaluation is based on perceived appraisal from their significant others, the endorsement should be a major lift to their academic self-concept.

In addition to the home environment measures, the current study also documented positive and significant relationships between the students' academic self-concept scores and their classroom climate scores ($0.29 \leq r \leq 0.61$).

The aforementioned findings are consistent with that of reviewed studies. In essence, Liu (1994) documented positive and significant relationships between the score of the academic self-concept scale and the scores of the their classroom climate variables, namely, classroom climate scale ($r = 0.47$), relationship with teachers subscale ($r = 0.38$), teachers' expectations subscale ($r = 0.45$) and peer relationship subscale ($r = 0.31$). The study also established similar relationships between the scores of the academic self-concept subscales, namely, students' confidence subscale ($0.22 \leq r \leq 0.32$) and students' effort subscale ($0.32 \leq r \leq 0.50$), and the scores of the classroom climate variables. Quek (1988) demonstrated similar findings for the relationships between the score of the academic self-concept scale and the scores of the school social climate variables, namely, school social climate scale ($r = 0.35$), teachers' support subscale ($r = 0.21$), academic expectations subscale ($r = 0.37$), and students' behaviour and peer relationships subscale ($r = 0.29$). The study also established similar relationships between the scores of the academic self-concept subscales, namely, students' confidence subscale ($0.17 \leq r \leq 0.33$) and students' effort subscale ($0.16 \leq r \leq 0.37$), and the scores of the school social climate variables. Likewise, Mboya (1995) recorded positive and significant relationships between students' general school self-concept and their perception of teachers' behaviour, namely, teachers' support, interest and encouragement ($r = 0.23$), and teachers' expectations ($r = 0.30$). Sanders (1996) established similar association between students' academic self-concept and their perception of teacher support ($r = 0.109$). Wentzel (1997) recorded consistent result in the relationship between students' academic effort and perceived caring from teachers ($r = 0.36$).

Although the results are largely comparable, the relationships documented in the reviewed studies appear weaker than in the present study. The disparities in the strength of the relationships, as in Mboya's (1995) study of South African sample and Sanders' (1996) study of African American sample, may be explicable in part by cultural variations in the context of the school environment. Alternatively, the discrepancies, as in the case of Quek's (1988) and Liu's (1994) studies, may be explained by the differences in sample characteristics. Indeed, further analyses in Quek's study again revealed differences between schools in the school social climate scores, and in the relationships between the academic self-concept scores and the school social climate scores. The subgroup analysis of Liu's study likewise established stronger relationships between the academic self-concept scores and the classroom climate scores of the Secondary 1 students than that of the Secondary 4 students.

Despite slight inconsistencies amongst studies, there is clear support that students' academic self-concept is positively related to their perception of classroom climate, particularly, their relationships with teachers and peers, and teachers' expectations. These findings can be explicable by the fact that teachers and classmates, together with parents and close friends, are amongst the 'significant others' in the lives of most students (Burns, 1979; Claes, 1998; Rosenberg, 1979). Thus, it is relevant that perceived positive regard and emotional support from teachers and classmates would convey strong messages to the students of their inherent self-worth. Since teachers are the primary adult figures in the academic domain, perceived support from them in particular would be a lift to students' self-evaluation of academic competence.

From another perspective, it is plausible that close relationship with teachers has an indirect effect on students' academic self-concept via greater academic motivation, stronger belief about personal control, and greater involvement in school. Essentially, some researchers have contended that 'feelings of belongingness and of being cared for can foster the adoption and internalisation of goals and values of caregivers' (Wentzel, 1997, p. 411). In the context of schooling, this notion suggests that students may be more motivated academically if they perceive close relationship with their teachers (Wentzel, 1997). In such a situation, it is explicable that positive student-teacher relationships may enhance students' academic self-concept. Similarly, it has also been suggested that 'a sense of emotional security with teachers and utilisation of teachers as emotional and school supports is associated with greater sense of control, autonomy and engagement in school' (Ryan et al., 1994, p. 244). Since personal beliefs of control are related to how well students learn, regardless of the quality of instruction (Perry & Tuna, 1988), it is tenable that students' beliefs that teachers are caring and supportive may enhance their self-evaluation of academic ability.

Considering that teachers are students' 'significant others' (Burns, 1979; Rosenberg, 1979), their beliefs in students' academic competence, when perceived positively by the students should serve as votes of confidence that encourage the growth of students' academic self-concept (Burns, 1982). However, when perceived negatively, they may perpetuate destructive cycles of self-fulfilling prophecies that debase students' academic self-concept. In this view, it is not surprising that teachers' expectations are found to be one of the strongest correlates of students' academic self-concept.

Despite the appeal of the aforementioned explanations, it remains plausible that students who already have high academic self-concept may be inclined to view their classroom climate in a positive manner. By virtue of their positive academic self-concept, they may perhaps draw from teachers and classmates greater relational supports, and influence teachers' expectations of their academic abilities. Due to the correlational nature of the findings, it is not possible to draw any conclusive answer in terms of causality.

In sum, the results are able to demonstrate that for **research question 4(a)** (Section 2.8), *there is significant relationship between students' academic self-concept and their perceived home environment and classroom climate in Secondary 1, 2 and 3.*

5.4.2 Male and Female Students

It will be recalled that the relationships between the academic self-concept scores and the home environment scores of both genders were highly comparable in most cases. However, the female students had significantly stronger relationship between the score of the students' effort subscale and the score of the home environment scale at $time_2$ (end of Secondary 2) than the male students.

The absence of a gender effect on most of the relationships between the academic self-concept scores and the home environment scores mirrors that of reviewed studies. In essence, Lau and Leung (1992) did not establish any gender effect on the relationship between students' academic self-concept and relation with parents. Likewise, Liu (1994) failed to detect any gender effect on the relationships between scores of the students' academic self-concept variables, namely, academic self-concept scale, students' confidence subscale and students' effort subscale, and scores of the home environment variables, namely, home environment scale, relationship with parents subscale and academic support subscale. Taken together, the results suggest that male and female students' perceptions of home environment are closely related to their academic self-concept. The finding can be explained by reasons suggested for the overall sample, and by the fact that parents are important to both genders.

Although the current gender effect at the end of Secondary 2 is inconsistent with that of Liu (1994), the disparities in findings are not surprising since Liu only looked at gender effect on the overall correlates of Secondary 1 and 4 students.

In Singapore, internal streaming is carried out at the end of Secondary 2 to channel students into science, commerce, technical or art courses within the same ability stream. Considering that the gender effect in the current study coincided with the internal streaming process, it is plausible that the result is a reflection of female students' greater need for parental encouragement and support in the face of intense evaluation and competition. The contention is tenable since sons are generally socialised to be independent, whilst daughters are allowed to be more dependent on family for support and assistance (Stage & Maple, 1996).

In addition to the home environment findings, the current result also established largely comparable relationships between the academic self-concept scores and the classroom climate scores of both genders. However, the female students had significantly stronger relationships between the scores of the academic self-concept variables, namely, academic self-concept scale and students' effort subscale, and the score of the relationship with teachers subscale at $time_0$ (beginning of Secondary 1) than the male students. In contrast, the male students had significantly stronger relationship between the score of the academic self-concept scale and the score of the teachers' expectations subscale at $time_2$ (end of Secondary 2) than the female students.

The absence of a gender effect on most of the relationships between the academic self-concept scores and the classroom climate scores is similar to that of Liu (1994). In essence, the earlier study did not establish any significant gender effect on the relationships between the scores of the students' academic self-concept variables, namely, academic self-concept scale, students' confidence subscale and students' effort subscale, and the scores of their classroom climate variables, namely, classroom climate scale, relationship with teachers subscale, teachers' expectations subscale and peer relationship subscale. Taken together, the results suggest that male and female students' perceptions of classroom climate are closely related to their academic self-concept. The results can be explained by reasons suggested for the overall sample, and by the fact that teachers and classmates are the 'significant others' in the lives of most boys and girls.

The current gender effects at the beginning of Secondary 1, and at the end of Secondary 2 are inconsistent with that of Liu (1994). However, the disparities in findings are not unexpected since subtle gender differences at specific grade levels could have been masked in Liu's overall sample of Secondary 1 and 4 students.

The significant gender differences in this study suggest that different aspects of classroom climate have differential influence on the academic self-concept of male and female students. In particular, the significant gender effects on relationship with teachers show that support and confirmation of close relationships with teachers may have more bearing on female students' academic self-concept than that of male students. The finding is explicable since girls tend to have greater needs for affection and close relationships with adults (Block, 1983; Ruble, 1984). They also tend to be more sensitive to feedback and more affected by others' evaluation (Golombok & Fivush, 1994; Rosenberg & Simmons, 1975), particularly teachers' evaluation (Lackovic-Grgin & Dekovic, 1990). From another perspective, the finding may be related to the fact that most of the teachers in Singapore are females (64% in secondary schools and 79% in primary schools, MOE, 1999). There is evidence to suggest that the career aspirations of female college students is most strongly predicted by the support and mentoring of their female teachers (Hacket, Esposito & O'Halloran, 1989). Thus, it is tenable that female students may find it easier to relate to their female teachers and be inspired by them academically than male students.

The other significant gender effect on teachers' expectations suggests that teachers' belief may have a stronger influence on male students' academic self-concept than that of female students. The finding is explicable since male students tend to thrive better in competitive situation than female students (Boaler, 1997a, 1997b). Presumably, if they respond better to the challenges and votes of confidence of teachers' expectations than female students, then it is not surprising that their perceived level of expectations should have more consequential effect on their academic self-concept than their female counterparts.

In sum, there is evidence to establish that for **research question 4(b)** (Section 2.8), *there is significant difference between genders in the relationships between students'* *academic self-concept and their perceived home environment and classroom climate in Secondary 1, 2 and 3.*

5.4.3 Express and Normal Students

As highlighted in Section 4.4.3, largely comparable relationships were established between the academic self-concept scores and the home environment scores of the Express and Normal students. However, the Express students had significantly stronger relationships between the score of the students' effort subscale and the scores of the home environment variables, namely, home environment scale and academic support subscale, at $time_2$ (end of Secondary 2) than the Normal students.

The absence of a stream effect on most of the relationships between the academic self-concept scores and the home environment scores is consistent with that of Liu (1994). In essence, the earlier study did not establish any significant stream effect on the relationships between the scores of the academic self-concept variables, namely, academic self-concept scale, students' confidence subscale and students' effort subscale, and the scores of the home environment variables, namely, home environment scale, relationship with parents subscale and academic support subscale. Taken as a whole, the results underline that Express and Normal students' perceptions of home environment are closely related to their academic self-concept. This finding can be rationalised by reasons suggested for the overall sample, and by the fact that parents are important to all students, regardless of their stream membership.

Although the current stream effects at the end of Secondary 2 are inconsistent with that of Liu (1994), the disparities in findings are not surprising since Liu only looked at stream effect on the overall correlates of Secondary 1 and 4 students.

Bearing in mind that internal streaming happens at the end of Secondary 2, the stream effects documented in the current study suggest that Express students may be more dependent on parents for encouragement and support during the crucial period of internal streaming than Normal students. This differential dependency may stem from the fact that higher-ability stream classroom environment is typically more pressurising and stressful than lower-ability stream classroom environment.

In addition to the home environment findings, the current result also established highly comparable relationships between the academic self-concept scores and the classroom climate scores of the Express and Normal students. However, the Normal students had significantly stronger relationship between the score of the students' confidence subscale and the score of the teachers' expectations subscale at $time_3$ (end of Secondary 3) than the Express students.

The absence of a stream effect on most of the relationships between the academic self-concept scores and the classroom climate scores mirrors that of Liu (1994). In essence, Liu (1994) did not establish any significant stream effect on the relationships between the scores of the academic self-concept variables, namely, academic self-concept scale, students' confidence subscale and students' effort subscale, and the scores of the classroom climate variables, namely, classroom climate scale, relationship with teachers subscale, teachers' expectation subscale and peer relationship subscale. The convergence of findings affirms that Express and Normal students' perceptions of classroom climate, particularly, their relationships with teachers and peers, and teachers' expectations, are closely related to their academic self-concept. This finding can be rationalised by reasons suggested for the overall sample, and by the fact that teachers and classmates are the 'significant others' of most students, regardless of their stream membership.

In the light of the aforementioned contention, it is noteworthy that there were significant stream effects on the classroom climate and academic self-concept scores of the current study (refer to Section 4.3.3 and Section 4.1.3 respectively). Essentially, the Express students had higher classroom climate scores at $time_0$, and lower relationship with teachers scores at $time_1$ and $time_3$ than the Normal students. They also had higher academic self-concept scores at $time_0$, and lower academic self-concept scores at $time_3$ than the Normal students. Taken together with the correlational results, the findings lead one to believe that students may have difficulties devaluing the influence of reflected appraisals from teachers and classmates on their academic self-concept, even when they are perceived to be negative. In addition, they suggest that stream effects on students' academic self-concept may be related to stream effects on their perception of classroom climate.

The current stream effect at the end of Secondary 3 is inconsistent with that of Liu (1994). However, the disparities in findings are not unexpected since subtle stream effects could have been masked in Liu's overall sample of Secondary 1 and 4 students.

The aforementioned stream effect suggests that the influence of teachers' belief may be stronger on Normal students' level of academic confidence than that of Express students. Without further evidence, it can only be speculated that Normal students' self-evaluation of academic competence may be more susceptible to votes of confidence from their teachers because they had been labelled publicly as less academically inclined.

In summary, the evidence shows that for **research question 4(c)** (Section 2.8), *there is significant difference between streams in the relationships between students' academic self-concept and their perceived home environment and classroom climate in Secondary 1, 2 and 3.*

5.4.4 Lower Express and Higher Normal Students

The results established largely comparable relationships between the academic self-concept scores and the home environment scores of the Lower Express and Higher Normal students. However, the Higher Normal students had significantly stronger relationship between the score of the students' effort subscale and the score of the relationship with parents subscale at time$_3$ (end of Secondary 3) than the Lower Express students.

The presence of only one stream effect upholds the earlier contention that students' perception of home environment, particularly, their relationships with parents and parental academic support, is closely related to their academic self-concept regardless of their stream membership. The finding is interesting in view of the fact that the Higher Normal students had more negative perception of relationship with parents than the Lower Express students at the beginning of the study (see Section 4.2.4). The absence of stream effect, in spite of the differential perceptions, affirms the central role of parents in the life of adolescents, so much so that their influence cannot be detracted even when they are perceived to be negative.

Despite similarities in the relationships of the two subgroups of students, the significant stream effect suggests that the influence of home environment may be different for Lower Express and Higher Normal students. Specifically, Higher Normal students' perception of relationships with parents seems to have greater influence on their academic self-concept than that of Lower Express students. It will be recalled that there was no significant stream effect at the end of Secondary 3 on any of the home environment measures (refer Section 4.2.4). Thus, the stronger relationships cannot be explicable by better parental relationship.

In contrast to that of the home environment findings, four of the relationships between the Higher Normal students' academic self-concept scores and their classroom climate scores were not significant. In addition, the Higher Normal students had significantly weaker relationships between the scores of the academic self-concept variables, namely, the academic self-concept scale and the students' effort subscale, and the scores of several of the classroom climate variables at $time_0$ and $time_1$ than the Lower Express students.

The current results highlight that Higher Normal students' perception of classroom climate, particularly, their relationships with teachers and teachers' expectations, may have a weaker influence on their academic self-concept than that of Lower Express students. There are two possible reasons for the finding. Considering that the Higher Normal students had significantly lower perception of classroom climate immediately after the streaming exercise than the Lower Express students (see Section 4.3.4), they might have chosen to devalue the impact of perceived classroom climate on their academic self-concept. From the other perspective, the influence of perceived classroom climate on the Higher Normal students' academic self-concept might have been overshadowed by more dominant influence of their perceived home environment.

Based on the aforementioned findings, there is adequate evidence to answer **research question 4(d)** (Section 2.8). Accordingly, *there is significant difference between Lower Express and Higher Normal students in the relationships between students' academic self-concept and their perceived home environment and classroom climate in Secondary 1, 2 and 3.*

5.4.5 Summary of Main Points

- Students' academic self-concept is related to their perception of home environment. The finding is explicable by the fact that parents are amongst the most important people in the world of adolescents. Their affections can enhance adolescents' sense of self-worth, and their support can be seen by adolescents as an endorsement of their academic abilities.

- With the exceptions of Higher Normal students, students' academic self-concept is related to their perception of classroom climate. The finding is explicable by the fact that teachers and peers are amongst the 'significant others' of most students. Thus, teacher's affection can enhance students' sense of self-worth. It can also have an indirect effect on students' academic self-concept via greater academic motivation, stronger belief about personal control, and greater involvement in school. In addition, teachers' expectations can serve as votes of confidence that encourage the growth of students' academic self-concept.

- Female students' effort level at the end of Secondary 2 tends to be more closely related to their perception of home environment than that of male students. The finding is probably a reflection of female students' greater dependency on parental support in the face of intense pressure during the internal streaming process.

- Female students' academic self-concept at the beginning of Secondary 1 tends to be more closely related to their perceived relationships with teachers than that of male students. The finding may be explicable by their greater needs for affection and close relationships with adults, and the greater ease in which they relate to teachers, who are predominantly females in Singapore.

- Male students' academic self-concept at the end of Secondary 2 tends to be more closely related to their perceived teachers' expectations than that of female students. The finding may reflect male students' ability to thrive better in competitive situations than female students.

- Express students' effort level at the end of Secondary 2 tends to be more closely related to their perceived home environment and academic support than that of Normal students. The result is probably a reflection of their greater dependency on parental support in the face of intense pressure during the internal streaming process, especially since the Express stream environment is typically more competitive and stressful.

- Normal students' confidence level at the end of Secondary 3 tends to be more closely related to their perceived teachers' expectations than that of Express students. It can only be speculated that being labelled as less academically inclined when they were streamed may have made them more susceptible to the influence of teachers' beliefs than their Express counterparts.

- Higher Normal students' effort level at the end of Secondary 3 tends to be more closely related to their perceived relationship with parents than that of Lower Express students. The reason for the significant stream effect remains unclear.

- Higher Normal students' academic self-concept tends not to be related to their perception of classroom climate. Their academic self-concept also tends to relate less to their perception of classroom climate, particularly, their relationship with teachers and teachers' expectations, than that of Lower Express students. The finding suggests that Higher Normal students may be able to devalue the impact of negative classroom climate on their academic self-concept. Alternatively, Higher Normal students' perception of home environment may have overshadowed the influence of their perception of classroom climate on academic self-concept.

5.5 Predictors of Students' Academic Self-Concept

The discussion in the section is carried to find out about the predictors of students' academic self-concept (see Section 2.8). In essence, stepwise multiple regressions were performed for the overall sample and for each subgroup of students to identify the best predictors of students' academic self-concept. It will be recalled that predictive variables that were measured prior to the academic self-concept variables under consideration were referred to as past variables, while those measured at the same time were referred to as present variables. Specifically, for each group of students, four sets of regressions were performed. They examined the contributions of the present environmental scales on students' overall academic self-concept, the past and present environmental scales on students' overall academic self-concept, the present environmental subscales on students' confidence and students' effort, and the past and present environmental subscales on students' confidence and students' effort respectively.

5.5.1 Overall Sample

As noted in Section 4.5.1, the present home environment and classroom climate scales were all significant predictors of students' overall academic self-concept (33.74% to 44.80%). In addition, there appeared to be a shift in importance of predictors from the classroom climate scales to the home environment scales over the 3-year period. Specifically, the classroom climate scales were the major predictors at time$_0$ and time$_1$, while the home environment scales were the major predictors at time$_2$ and time$_3$.

The overall result of the regression analyses is consistent with those of the reviewed studies. Lau and Leung (1992) documented significant main effects of relation with parents and relation with school on students' academic self-concept. Raw and Marjoribanks (1991) recorded that family and school environments uniquely explained 9.49% and 3.15% respectively of the variances in students' academic self-concept. Quek (1988) established that school social climate and home support were both significant predictors of students' academic self-concept. Specifically, school social climate scale accounted for 10.88%, 8.42% and 10.91% of the variances in students' overall academic self-concept, students' confidence and students' effort respectively in addition to that explained by home environment and socio-economic variables. Moreover, home support explained an extra 0.73% and 1.02% of the variances in students' overall academic self-concept and students' confidence respectively in addition to the contributions of the school social climate and socio-economic variables. Liu (1994) found that students' perceived home environment and classroom climate were significant predictors of their academic self-concept. Specifically, perceived home environment explained an extra 5.83% and 4.25% of the variances in students' academic self-concept and students' effort respectively in addition to that explained by perceived classroom climate (22.25% and 24.82% respectively). Moreover, perceived classroom climate explained an extra 3.68% of the variance in students' confidence subscale in addition to that explained by perceived home environment (10.83%).

Although the variances explained and the relative importance of the environmental variables differ amongst studies, there is evidence to suggest that students' perceived home environment and classroom climate have substantial bearing on their academic self-concept. The finding is not surprising since parents, teachers and classmates are amongst the 'significant others' in the lives of most adolescents (Burns, 1979; Claes, 1998; Juhasz, 1989a, 1989b; Rosenberg, 1979).

With regard to the shift in importance of predictors from the classroom climate scales to the home environment scales over the 3-year period, the early dominance of perceived classroom climate may be explained in part by the effect of students' transition from primary to secondary school. Without objective measure of academic ability in the form of academic results, Secondary 1 and 2 students may not have a clear idea of their standing among their reference group. Conceivably, their perceived teachers' evaluation and definition of them, whether in terms of expectation or positive regard, may have a substantial impact on their self-evaluation, possibly more than in other situations. From another perspective, the emergence of perceived home environment as a minor predictor during early adolescence may be a natural consequence of students' quest for physical and psychological autonomy (refer to Section 5.2.1). Since the quest for autonomy involves physical distancing from parents, and renegotiations of boundaries and mutual needs (Dacey & Kenny, 1997), there are possibilities of less time spent together and conflicts in the negotiation process. Thus, it is tenable that the home environment may have less bearing on students' academic self-concept than the new environment of secondary school.

After two to three years in secondary school, however, students should have found their niches and established themselves with their peers. They should also have a clear idea of their academic abilities in comparison to their classmates. Consequently, it is not surprising that perceived classroom climate has less impact on students' academic self-concept than it had in the earlier years. The diminishing influence of perceived classroom climate probably coincides with an increase in students' dependency on parents for support during the crucial stage of internal streaming at the end of Secondary 2, and a rapprochement in new adolescent-parent relationships during mid-adolescence. Hence it is comprehensible that perceived home environment replaces perceived classroom climate to become the major predictor of students' academic self-concept towards the later part of the study.

As noted in Section 4.5.1, the third and fourth sets of regressions revealed that Secondary 1 and 2 class positions were the only significant non-environmental predictors of students' academic self-concept (subscales). Amongst the environmental variables, the teachers' expectations subscales were consistent predictors of students' confidence and students' effort, and the relationship with parents subscales were consistent predictors of students' effort. The rest of the environmental variables did not feature consistently. Nonetheless, the relationship with teachers subscales were major predictors of students' effort at $time_0$ and students' confidence at $time_3$, while the academic support subscales were major predictors of students' confidence at $time_0$ and $time_2$.

The failure of the other non-environmental variables, namely, socio-economic status, gender and stream, to predict students' confidence or students' effort suggests that the education policy in Singapore does not discriminate against students with regard to their socio-economic background. It also supports the earlier contention that teachers and parents may not discriminate against students with respect to their gender. More importantly, it suggests that Normal students' academic self-concept has not been crippled by the stigmatisation effect of their stream membership.

Given the heavy emphasis on competition and pressures applied by teachers and parents on children to achieve academically (Burns, 1982), it is not surprising that academic attainment, in the visible form of class positions, was a significant predictor of students' academic self-concept. Nonetheless, it is noteworthy that the variances explained were not very substantial as compared to that of the environmental predictive variables.

The emergence of perceived teachers' expectations as consistent predictors of students' confidence and students' effort highlights the impact teachers can have on their students. The finding is explicable by the fact that expectations represent teachers' beliefs in their students' academic competence and abilities (Burns, 1982). If they are set at a reasonable level, they serve as votes of confidence that encourage the growth of self-concept. In contrast, if they are set at too low or too high a level, they convey the message that the teachers do not care, or they leave the students with a sense of inadequacy and failure (Lawrence, 1988).

Parents are among the most significant people in the lives of adolescents (Juhasz, 1989a, 1989b; Juhasz & Yue, 1989; Lempers & Clark-Lempers, 1992). Thus it is not surprising that perceived relationships with parents consistently predicts students' effort. As mentioned earlier, if students enjoy close and loving relationships with their parents, their parents will have the potential to influence their children such that they channel their energy constructively in the pursuit of academic excellence. On the other hand, if students perceive cold and distant relationships with their parents, the lack of support and warmth from their parents may undermine their effort level. In most cases, however, the problem is compounded when students turn to their peers for acceptance in an attempt to fill the emotional gap. Conceivably, peer groups may not place a high premium on academic achievements, so it is possible that the students may channel their energy elsewhere, resulting in a decrease in academic effort.

It was highlighted that relationship with teachers was a major predictor of students' effort at the beginning of Secondary 1. The finding supports the earlier contention that in the absence of objective feedback, students' perception of teachers' acceptance and support may have an important influence on their self-evaluation. On the basis of this finding, teachers should take extra care when they interact with students, particularly Normal students who may be emotionally vulnerable immediately after being streamed.

It was also noted that academic support was a major predictor of students' confidence at the end of Secondary 2. The finding substantiates the postulation that students turn to their parents for support when faced with the intense pressure from internal streaming. Presumably, the positive reinforcement, encouragement and help given by parents serve as endorsements of their academic abilities, so it is understandable that perceived academic support should have such a major impact on their confidence level at the crucial stage of internal streaming.

In sum, for **research question 5(a)(i)** (Section 2.8), there is clear support that *perceived home environment and classroom climate are significant predictors of students' academic self-concept in Secondary 1, 2 and 3.*

5.5.2 Male and Female Students

It will be recalled that the stepwise regression results of the male and female students were largely similar to that of the overall sample, and most of the results can be rationalised by reasons highlighted in Section 5.5.1. Despite the similarities, there were several notable differences between the results.

Firstly, the shift from the classroom climate scales to the home environment scales as major predictors of students' overall academic self-concept happened at $time_3$ for the male students, but at $time_2$ for the female students and the overall sample.

The emergence of the home environment scale as the major predictor of female students' overall academic self-concept at the end of Secondary 2 possibly reflects their dependency on parents for support and encouragement during the stressful period of internal streaming. Research by Boaler (1997a, 1997b) found that male students, as compared to female students, thrived better in the highly stressful and competitive environment of top-set classes. In line with this evidence, they may cope better with the stress and pressure of evaluation and competition than female students. In such view, they may be less dependent on their parents for support and encouragement during internal streaming. Thus it is tenable that their perception of home environment at the end of Secondary 2 has less impact on their academic self-concept than that of their female counterparts.

Secondly, although PSLE result and stream were not significant predictors of students' confidence and students' effort for the overall sample and male students, they were significant predictors for the female students. The finding suggests that female students may be more affected by poor PSLE result and the streaming outcome than their male counterparts.

Thirdly, there were interesting differences in the contributions of the environmental variables to the variances in students' confidence and students' effort for male and female students. Essentially, the teachers' expectations and relationship with parents subscales had more consistent and substantial impact for the male students than the female students. In contrast, the relationship with teachers and academic support subscales had more consistent and substantial impact for the female students than the male students.

The relative contributions of the classroom climate subscales on students' confidence and students' effort for the male and female students are in line with the correlational results (see Section 4.4.2). Specifically, the correlational results established that the male students had stronger relationship between the score of the academic self-concept scale and the score of the teachers' expectations subscale at $time_2$ than the female students. In addition, the female students had stronger relationships between the scores of the academic self-concept factors, namely, academic self-concept scale and students' effort subscale, and the score of the relationship with teachers subscale at $time_0$ than the male students. Taken together, the regression results provide support for the reasons suggested in Section 5.4.2. That is, male students may thrive better in competitive situations than female students (Boaler, 1997a, 1997b), so they may respond better to the votes of confidence of teachers' expectations than their female counterparts. On the other hand, female students may have greater needs for affection and close relationships with adults than male students (Block, 1983; Ruble, 1984). They may also relate better and be inspired more by their teachers, who are predominantly females in Singapore. Hence they may respond better to personal relationships with teachers than their male counterparts.

In addition to the aforementioned, the regression results suggest that between the home environment variables, perceived academic support may have a greater impact on students' confidence and students' effort for the female students than their male counterparts. In contrast, perceived relationship with parents may have a greater impact for the male students than their female counterparts. The emergence of academic support as a major predictor for the female students is possibly a reflection of their greater dependence on parental encouragement and help in the academic domain. This is not unexpected since sons are generally socialised to be independent, whilst daughters are allowed to rely on family for support and assistance (Stage & Maple, 1996). In the light of the disparate socialisation experiences, it is tenable that female students may respond better to parental academic support than male students. Considering that girls are generally more people-oriented and more eager to please (Rosenberg & Simmons, 1975), it appears contradictory that perceived relationships with parents have less influence on the female students than their male counterparts. Without other evidence, it can only be speculated that the influence of perceived academic support could have overshadowed the influence of perceived relationships with parents on students' confidence and students' effort for female students.

Finally, in contrast to the findings of the overall sample and the male students, for the female students, the academic support subscale at the end of Secondary 2 contributed rather substantially to students' confidence at the end of Secondary 3 (8%). The result suggests that female students may be affected more by past experiences than male students, and it shows that academic support provided during internal streaming may have a far-reaching consequence on female students' later academic self-concept than that of their male counterparts.

To conclude, there is enough evidence to answer **research questions 5(b)(i) and 5(b)(ii)** (Section 2.8). Namely, *perceived home environment and classroom climate are significant predictors of male and female students' academic self-concept in Secondary 1, 2 and 3.*

5.5.3 Express and Normal Students

As noted in Section 4.5.3, the stepwise regression results of the Express and Normal students were similar to that of the overall sample, and most of the results can be explained by reasons suggested earlier in Section 5.5.1. Despite the similarities, there were a few key differences between the results.

Firstly, the shift from the classroom climate scales to the home environment scales as major predictors of students' overall academic self-concept happened at $time_3$ for the Normal students, but at $time_2$ for the Express students and the overall sample.

The emergence of the home environment scale as the major predictor of Express students' overall academic self-concept at the end of Secondary 2 suggests that they are more dependent on parents for support and encouragement during the stressful period of internal streaming than the Normal students. The contention is plausible since higher-ability stream classroom climate is normally more competitive and more evaluative than lower-ability stream classroom climate, so it is tenable that they may need more parental support and encouragement to cope with their successes and failures that their counterparts in the Normal stream.

Secondly, Secondary 1 and 2 class positions could explain up to an additional 8.5% of the variances in students' academic self-concept (subscales) for the Express students, but only an extra 5.5% of the variances for the Normal students. The finding suggests that Express students' academic self-concept are more affected by academic grades than that of Normal students. It may be explicable by the aforementioned contention that higher-ability stream classroom climate is typically more evaluative and competitive than lower-ability stream classroom climate. In addition, there may be heightened pressures by teachers and parents on higher-ability stream students to achieve academically because of their stream membership. Hence it is not surprising that Express students and their parents place a lot more emphasis on academic grades than their Normal counterparts.

Thirdly, although PSLE result was not a significant predictor of students' confidence or students' effort for the overall sample and the Express students, it was a significant predictor for the Normal students. This finding suggests that Normal students' PSLE result may have more substantial and lasting influence on their academic self-concept than that of their Express counterparts. The finding is not surprising since Normal students were streamed into the lower-ability stream based on their PSLE results. Presumably, their poor results may have affected their self-evaluation of academic competence more than that of the Express students.

Fourthly, there were interesting differences in terms of the contributions of the environmental variables to the variances in students' confidence and students' effort for the Express and Normal students. Essentially, the academic support subscales had more consistent and substantial impact for the Express students than the Normal students. In particular, it is noteworthy that academic support was a major predictor of students' confidence and students' effort for the Express students at $time_2$. On the other hand, although the teachers' expectations subscales had consistent impact on students' effort for both Express and Normal students, they had more consistent and substantial impact on students' confidence for the Normal students than the Express students. In addition, the relationship with teachers subscale was a major predictor of students' effort at $time_0$ for the overall sample and the Normal students, but it was not a significant predictor for the Express students.

The emergence of perceived academic support as consistent and substantial predictor for the Express students substantiates the contention that Express students may be more dependent on parents for support in the highly competitive and evaluative higher-ability stream classes, especially during internal streaming. Hence, it is not unexpected that they may respond better to perceived academic support than their Normal counterparts.

The relative contributions of teachers' expectations on students' confidence for the Express and Normal students are in line with the correlational results (see Section 4.4.3). Specifically, the correlational result established that the Normal students had significantly stronger relationship between the score of the students' confidence subscale and the score of the teachers' expectations subscale at $time_3$ than the Express students. Bearing in mind that perceived teachers' expectations had consistent impact on students' effort for the Express and Normal students, the finding suggests that all students regardless of their stream membership respond to teachers' beliefs in their academic abilities. Without further investigation, it can only be speculated that Normal students' level of academic confidence may be more susceptible to teachers' votes of confidence than their Express counterparts because they had been publicly labelled as less academically inclined.

In addition to the aforementioned, the regression results reveal that the emergence of the relationship with teachers subscale as a major predictor of students' effort for the overall sample at $time_0$ was largely due to its impact on the Normal students. It will be recalled that the Normal students had significantly more negative perception of their relationship with teachers at $time_0$ than the Express students (see Section 4.3.3). Due to the short time frame, it was suggested that being streamed into the Normal stream may have affected the students' sense of self-worth, and that in turn may have resulted in them interpreting the less personal student-teacher relationships in secondary school as rejections (see Section 5.3.3). From the regression results, it appears that although the situation may be more perceived than real, they are real in their consequences. Thus it is a concern that educators may want to address.

Finally, in contrast to that of the overall sample and the Express students, a number of the environmental subscales measured during Secondary 1 contributed rather substantially to students' confidence and students' effort of the Normal students in the later stage of the study. In particular, the relationship with parents subscale at $time_1$ was the second major predictor of students' effort at $time_2$, and it explained an extra 7.35% of the variance. This result suggests that Normal students may be more affected by past experiences than their Express counterparts. Specifically, their perception of parental regard during their first year in the Normal stream appears to have a far-reaching consequence on their later academic self-concept than that of their Express counterparts.

In summary, for **research question 5(c)(i) and 5(c)(ii)** (Section 2.8), there is clear evidence that *perceived home environment and classroom climate are significant predictors of Express and Normal students' academic self-concept in Secondary 1, 2 and 3.*

5.5.4 Lower Express and Higher Normal Students

As noted in Section 4.5.4, the stepwise regression results of the Lower Express and Higher Normal students were not unlike that of the overall sample, and most of the results can be explained by reasons suggested earlier in Section 5.5.1. Despite the similarities, there were a number of differences between the results.

Firstly, unlike that of the overall sample and the Express or Normal students, there appears to be an overwhelming dominance of the home environment scales as predictors of Lower Express and Higher Normal students' overall academic self-concept over the 3-year period. Specifically, the home environment scales were major predictors of Lower Express students' overall academic self-concept on three out of four occasions, and they were major predictors of Higher Normal students' overall academic self-concept on all four occasions.

The aforementioned results suggest that for both subgroups of students, their academic self-concept may be more dependent on their perceptions of home environment than more representative groups of Express and Normal students. The finding of the Lower Express students may be related to the fact that they are possibly the less academically inclined students in their homogeneous classes. Considering that higher-ability stream classroom climate is generally more evaluative and competitive, they may need a lot of encouragement and support from their parents to cope with their share of failures than the average Express students. Hence it is tenable that they may respond better to a more supportive home environment than those who are not captured at the bottom of their classes.

The finding of the Higher Normal students is less easily explicable. Without further investigation, it can only be speculated that home environment may play a major role in how these students cope with the disappointment of being streamed into the lower-ability stream. Presumably, if the students enjoy close relationships with their parents and have strong parental support, their parents may be in the position to help them overcome the sense of disappointment and failure. In such a situation, it may be easier for them to rebuild their academic self-concept and strive on for academic excellence. On the other hand, if the students do not have any support from their parents, their sense of failure and dejection may undermine their academic self-concept, making any rebuilding work an uphill task.

Secondly, in contrast to that of the overall sample and other subgroups of students, many of the classroom climate scales were not significant predictors of Higher Normal students' overall academic self-concept. This finding seems to suggest that perceived classroom climate may not be important to Higher Normal students' academic self-concept. However, it is tenable that the influence of classroom climate on Higher Normal students' academic self-concept may have been overshadowed by the impact of their home environment.

Thirdly, Secondary 1 and 2 class positions could explain up to an additional 10% of the variances in students' academic self-concept for the Lower Express students, but only an extra 5% of the variances for the Higher Normal students. It will be recalled that similar results were documented for the Express and Normal students. As suggested earlier, the finding may be rationalised by the fact that higher-ability stream classroom climate is typically more evaluative and competitive than lower-ability stream classroom climate, so it is not surprising that Lower Express students and their parents place a lot of premium on their academic results. In effect, the situation may have been worse for the Lower Express students than the average Express students since they are often the 'little fishes in the big pond'. Despite being expected, it is noteworthy that an over-dependence on academic grades may be a limiting factor in students' future academic achievement, possibly through some sort of self-fulfilling prophecy on their academic self-concept.

Fourthly, although socio-economic status and gender were not significant predictors of students' confidence and students' effort for the overall sample and the Higher Normal students, they were significant predictors for the Lower Express students. They contributed an additional 3% to 4% of the variances. Although the variances explained were not substantial, their emergence as significant predictors suggests a need for more in-depth study of this unique group of students.

Fifthly, there were differences in terms of the relative contributions of the environmental variables to the variances of students' confidence and students' effort for the Lower Express and Higher Normal students. Essentially, the academic support subscales were more substantial predictors for the Lower Express students than the Higher Normal students. Although they were also consistent predictors for the Express students, the variances explained were less than that for the Lower Express students. Furthermore, the relationship with teachers subscale did not feature significantly for the Higher Normal students or the Express students at $time_0$, but it was the major predictor of students' effort for the Lower Express students.

In addition to the aforementioned, although the relationship with parents subscales were regular predictors of students' effort for the Lower Express students, the variances explained were much less than that for the Higher Normal students. Specifically, for the Higher Normal students, the subscales were consistent predictors of students' confidence, as well as major predictors of students' confidence at $time_0$ and $time_2$, and students' effort at $time_1$ and $time_3$. The overwhelming influence of the subscales on students' confidence and students' effort for the Higher Normal students, as compared to the other environmental subscales, has not been observed for any other subgroups of students.

The emergence of the academic support subscales as such substantial and consistent predictors for the Lower Express students may be related to the fact that they are often the 'little fishes in the big pond'. They may have greater needs for parental encouragement to help them cope with the constant reminders of failures in the highly competitive and evaluative environment of the higher-ability stream classes. As such, it is not surprising that they respond better to parental support than the average Express students. Since Higher Normal students are often the 'big fishes in the little pond', it is also understandable that their academic self-concept are less dependent on parental support than Lower Express students.

The regression result of the relationship with teachers subscale is less easily explicable. One speculation is that the Lower Express students would not be the most academically inclined students in their primary schools so they might not have enjoyed much attention from teachers. In such case, the situation would have been in stark contrast to their experience at the beginning of Secondary 1, in which they reported extremely positive perceived relationship with teachers (see Section 4.3.4). In view of the possible discrepancies in their perceptions of student-teacher relationships, it is perhaps tenable that they may respond better to personal relationship with teachers than the average Express students.

In addition to the aforementioned, the regression results of the Higher Normal students affirm that the dominance of the home environment scales noted earlier was predominantly due to the contributions of the relationship with parents subscales. The finding is not surprising since parents are the most significant people in the lives of adolescents (Juhasz, 1989a, 1989b; Juhasz & Yue, 1989; Lempers & Clark-Lempers, 1992). In this case, their overwhelming importance may be a reflection of Higher Normal students' need of positive regard from parents, especially immediately after the streaming process. As evident in Section 4.1.4, many Higher Normal students had very negative perception of their academic self-concept immediately after the streaming exercise, possibly because the disappointment had been worse for them than the average Normal students. Their undermined academic self-concept and disappointment would have made them vulnerable to criticisms. At that crucial stage, if their parents had reacted negatively towards the streaming outcome, the disappointment and anger conveyed to them would have driven them towards greater despair, eroding their already low academic self-concept. If the negative adolescent-parent relationship had been sustained over the years, it would have destroyed the students. On the other hand, if their parents had been supportive and did not discriminate against them based on their newly acquired stream membership, they would not have suffered the stigmatising effect of being in the lower-ability stream. In such a situation, it is conceivable that with the continued support and encouragement from their parents, they would have rebuilt their self-beliefs and gone on to achieve academic success in their more homogeneous classes.

Finally, the environmental scales and subscales appear to contribute rather substantially to the Lower Express and Higher Normal students' later academic self-concept. In essence, the home environment scale and subscales at $time_2$ contributed more substantially to the Lower Express students' later academic self-concept than that of the present environmental scales and subscales. In addition, the home environment scale and subscales at $time_0$ contributed more to the Higher Normal students' later academic self-concept than that of the present environmental scales and subscales.

The aforementioned result provides endorsement of the contention that Lower Express students may need more parental support and encouragement than the average Express students or the Higher Normal students. In this case, the finding affirms that supportive home environment during the crucial period of internal streaming may have a far-reaching consequence on their self-evaluation of academic ability at a later stage of their secondary education.

With regard to the results of the Higher Normal students, the finding suggests that their academic self-concept are influenced greatly by their perception of home environment, particularly, their relationship with parents, immediately after the streaming exercise.

To summarise, for **research question 5(d)(i) and 5(d)(ii)** (Section 2.8), there is clear evidence that *perceived home environment and classroom climate are significant predictors of Lower Express and Higher Normal students' academic self-concept in Secondary 1, 2 and 3.*

5.5.5 Summary of Main Points

Overall sample

(i) Students' perceptions of home environment and classroom climate are significant predictors of their academic self-concept. The finding underlines the central role in which parents, teachers and peers play in students' self-evaluation of academic competence.

(ii) Students' perception of classroom climate tends to have a greater influence on their academic self-concept during the first year in secondary schools, while their perception of home environment tends to have a greater influence during the second and third year. The early dominance of classroom climate may be rationalised by the effect of transition from primary to secondary schools, and students' quest for physical and psychological autonomy. The latter dominance of home environment is probably related to students' dependency on parental support during internal streaming at the end of Secondary 2, and a rapprochement in new adolescent-parent relationships.

(iii) Secondary 1 and 2 class positions are significant predictors of students' academic self-concept. The finding is not surprising given the heavy emphasis on competition and pressures applied by parents and teachers on children to achieve academically (Burns, 1982).

(iv) Teachers' expectations and relationship with parents are the most consistent predictors of students' academic self-concept. The findings are easily explicable since expectations represent teachers' beliefs in their students' academic competence and abilities (Burns, 1982). They serve as votes of confidence that encourage the growth of academic self-concept. On the other hand, parents are among the most significant people in the lives of adolescents (Juhasz, 1989a, 1989b; Juhasz & Yue, 1989; Lempers & Clark-Lempers, 1992), so positive regard from them convey strong messages to students about their inherent self-worth (Gecas & Schwalbe, 1986).

Male and female students

(i) For male students, perceived home environment tends to be the major predictor of their academic self-concept only at the end of Secondary 3. The finding may be a reflection of male students' ability to cope with internal streaming without any additional support from their parents.

(ii) Teachers' expectations tend to have more consistent and substantial impact on male students' academic self-concept than that of female students. The finding suggests that male students may respond better to the votes of confidence of teachers' expectations than their female counterparts, possibly because they thrive better in competitive situations (Boaler, 1997a, 1997b).

(iii) Academic support tends to have more consistent impact on female students' academic self-concept than that of male students. The finding suggests that female students may be more dependent on parents for academic support than male students.

(iv) Relationship with teachers tends to have more consistent and substantial impact on female students' academic self-concept than that of male students.

The finding suggests that female students may respond better to personal relationships with teachers than their male counterparts because of their greater needs for affection and close relationships with adults, and the greater ease in which they relate to teachers, who are predominantly females in Singapore.

(v) Relationship with parents tends to have more consistent impact on male students' academic self-concept than that of female students. Considering that girls are generally more people-oriented and more eager to please (Rosenberg & Simmons, 1975), the result appears contradictory. Hence it is speculated that the influence of relationship with parents on female students' academic self-concept may have been overshadowed by the influence of parental academic support.

(vi) Female students' perception of academic support during the crucial period of internal streaming has a substantial impact on their later academic confidence.

Express and Normal students

(i) For Normal students, perceived home environment tends to be the major predictor of their academic self-concept only at the end of Secondary 3. The finding may be a reflection of the students' ability to cope with internal streaming without any additional support from their parents.

(ii) Secondary 1 and 2 class positions have rather substantial impact on the academic self-concept of Express students.

(iii) Although teachers' expectations tend to predict students' effort level of both Express and Normal students, they tend to have more consistent and substantial impact on the confidence level of Normal students than that of Express students. Without further evidence, it is speculated that Normal students' susceptibility to teachers' votes of confidence may be related to the fact that streaming had publicly labelled them as less academically inclined.

(iv) Academic support tends to have more consistent and substantial impact on Express students' academic self-concept than that of Normal students. The finding suggests that Express students may be more dependent on parents for support because of the highly competitive and evaluative classroom climate of higher-ability stream classes.

(v) Normal students' perception of parental regard during the first year in the Normal stream has a substantial impact on their later academic self-concept.

Lower Express and Higher Normal students

(i) Perceived home environment tends to be the major predictor of Lower Express and Higher Normal students' academic self-concept during the first three years of their secondary education. The finding for the Lower Express students may be related to them being the 'little fishes in the big pond', hence their dependency on parental encouragement and support to cope with the stressful environment of higher-ability stream classes. The finding for the Higher Normal students may reflect the importance of home environment in helping students cope with the disappointment of being streamed into the lower-ability stream.

(ii) Similar to that of the Express students, Secondary 1 and 2 class positions have rather substantial impact on Lower Express students' academic self-concept.

(iii) Relationship with parents tends to be the only consistent predictor of Higher Normal students' academic self-concept. The findings may reflect the importance of parental regard in helping students cope with the disappointment of being streamed into the lower-ability stream.

(iv) Similar to that of Express students, academic support tends to have more consistent and substantial impact on Lower Express students' academic self-concept than that of their Normal counterparts. In fact, it also appears to have greater impact on Lower Express students' academic self-concept than that of the average Express students. The finding suggests that Lower Express students may be more dependent on parental support because of the highly competitive and evaluative classroom climate of higher-ability stream classes, and the fact that they are often the 'little fishes in the big pond'.

(v) Similar to that of the Normal students, Higher Normal students' perception of parental regard during the first year in the Normal stream appears to have a substantial impact on their later academic self-concept.

5.6 Additional Subgroups Comparisons

This section focuses on smaller, heterogeneous groups of students, namely, the ability bands of students and the clusters of students.

5.6.1 Ability Bands of Students

To recapitulate, the students in the ability bands, namely, Higher Express, Middle Express, Lower Express, Higher Normal, Middle Normal and Lower Normal, were identified by the streaming criterion, that is, PSLE results (see Section 2.9). Thus the students in the different ability bands had largely different academic abilities and aptitudes.

In this section, the discussion aims to establish whether there is any significant difference between the ability bands of students in terms of their academic self-concept, and their perceptions of home environment and classroom climate at each point in time (see Section 2.8).

As noted in Section 4.6.1, the ability bands had highly comparable academic self-concept over the 3-year period. The finding suggests an absence of devastating stream effect on students' academic self-concept. Although the differences between the ability bands were not significant, it is interesting to note that the Higher Normal students' academic self-concept was the lowest amongst the ability bands immediately after the streaming exercise, while that of the Lower Express students was the highest. In contrast, the Higher Normal students' academic self-concept was the highest amongst the ability bands at the end of Secondary 3, while that of the Lower Express students was among the lowest.

The aforementioned finding provides support for Marsh and Parker's (1984) BFLPE. In essence, it suggests that students' reference group may be more relevant to their self-evaluation of academic competence than their stream membership. Presumably Lower Express students, despite being in the higher-ability stream, may have rather low academic self-concept in the later stage of their secondary education because their abilities do not compare favourably with their more demanding reference group. On the other hand, Higher Normal students, despite being in the lower-ability stream, may have rather positive academic self-concept in the later stage of their secondary education because their abilities compare favourably with their less demanding reference group.

It will be recalled that the ability bands also had largely similar perceptions of home environment over the 3-year period. The congruency was only disrupted at $time_1$, when the Higher Express students had significantly lower score for the relationship with parents subscale than the Lower Express students. Basically, the Higher Express students were more inclined to agree that *their parents did not understand them*, and *their parents always scolded them*.

Taken as a whole, the result of students' perception of home environment is encouraging since it suggests that parents have equally favourable relationships with their children, regardless of their academic inclination, aptitude or their stream membership.

The highly comparable perceptions of the ability bands make it difficult to explain the significant difference between the Higher Express and Lower Express students at the end of Secondary 1. Without further evidence, it can only be speculated that because of their good PSLE results, Higher Express students may be under intense parental pressure to excel in Secondary 1 end-of-year examination. In such case, it is comprehensible that Higher Express students may lament that their parents do not understand them, and that their parents keep scolding them. Since Higher Express students are inclined to be the 'big fishes in the little pond', it is tenable that parental pressure would ease when their parents become aware of their children's standing amongst peers.

As highlighted in Section 4.6.1, the ability bands had very different perceptions of classroom climate. Most notably, at the beginning of Secondary 1, the Higher Normal students had significantly more negative perceptions of classroom climate and peer relationship than the Middle Express and Lower Express students, and significantly more negative perception of relationship with teachers than the Middle Express students. Basically, the Higher Normal students were more inclined to disagree that *their teachers tried to know them.* In addition, they were more disposed to agree that *there were groups of students who could not get along in their classes.*

The overall picture painted by the Higher Normal students at the beginning of Secondary 1 appears rather depressing. However, considering that the survey was conducted during the first week of term, and that the Middle Normal and Lower Normal students did not report similar findings, it is unlikely that the Higher Normal students' perception was accurate reflection of the situation. Hence, the significant differences may be rationalised by the negative impact of streaming per se. Presumably, the disappointment and unhappiness of being streamed into the lower-ability stream could have caused Higher Normal students to start school with predisposed negative attitudes towards their teachers and classmates. Their sense of failures could also have affected their self-worth, causing them to interpret the less personal student-teacher relationships in secondary schools as rejections.

Contrary to popular belief, the Higher Express students also had highly negative perception of their classroom climate. In essence, they had significantly more negative perception of classroom climate, particularly, relationship with teachers and teachers' expectations, than that of several other ability bands during the first two years of their secondary education. Generally, the Higher Express students were more inclined to disagree *that their teachers tried to get to know them*, and *their teachers enjoyed mixing with them at school functions*. In addition, they were more disposed to disagree that they found it *easy to talk to their teachers about their problems*. They were also more inclined to agree that *their teachers did not trust them*.

Due to the consistency in the aforementioned findings, they could not have happened by chance. It is unlikely that the teachers had consciously chosen to ignore or neglect the Higher Express students, especially since they were amongst the brightest students in class. It is perhaps more tenable that the teachers had devoted more attention to the weaker students such that they neglected the needs of these students. Although it is commendable that teachers channel their time and effort to help weaker students, it is not ideal if brighter students should suffer indirectly. As such, the issue may warrant some self-examination on the part of teachers so that a balance can be achieved.

Likewise, the Higher Express students' responses depicted a disturbing picture of their perception of teachers' expectations at the end of Secondary 1. Essentially, they were more inclined to agree that *their teachers believed that their class was weaker than other classes*, and *their teachers were only interested in the clever students in the class.* In addition, they tended to disagree that *their teachers were confident that they would get good results.* They were more inclined to agree that *their teachers embarrassed them for not knowing the right answers.* They were also more disposed to disagree that *their teachers made sure they worked hard for their exams*, and *their teachers encouraged those who failed to work harder.*

Bearing in mind that the Higher Express students were potentially the brightest students in their classes, it is incomprehensible that they complained that their teachers had no confident in their academic abilities, or that their teachers thought that their classes were weak. Instead of accepting the students' responses at face value, the negative responses may be a reflection of the pressure bright students experience in top classes. Considering the competitive and evaluative environment of higher-ability stream classes, it is tenable that teachers may have reminded their students, especially the bright students, constantly of their failures and shortcomings in an attempt to motivate them to greater academic success. Some teachers may also have 'taunted' their students when they do not know the answers to simple questions. In such a scenario, it is tenable that Higher Express students may have a negative perception of teachers' expectations.

In view of the fact that students' perceptions of relationship with teachers and teachers' expectations are both significant predictors of students' academic self-concept (see Section 5.5), it is important that such negative situation be redressed. However, before the issue can be resolved, teachers have to be aware of the impact they can have on their students. In addition, they have to be convinced that a positive approach characterised by encouragement and support is perhaps more conducive to the growth of students' academic self-concept than a negative approach typified by criticisms and taunts.

To conclude, for **research question 6(a)** (Section 2.8), there is no significant difference between ability bands in their academic self-concept, as a whole or in specific areas, in Secondary 1, 2 and 3. However, there are significant differences between ability bands in their perceptions of home environment and classroom climate, as wholes or in specific areas, in Secondary 1, 2 and 3.

5.6.2 Clusters of Students

To recapitulate, the clusters were identified with the help of the centroid relocation method based on the students' self-evaluation of their academic self-concept, home environment and classroom climate over the 3-year period. Thus the students in the different clusters had largely different trends with regard to their academic self-concept, and their perceptions of home environment and classroom climate.

The discussion in this section aims to answer three broad categories of research questions pertaining to the different clusters of students in terms of their academic self-concept, home environment and classroom climate. They are developmental changes of the clusters over time, subgroup comparisons by cluster at each point in time, and subgroup comparisons by cluster of developmental changes over time (see Section 2.8).

As noted in Section 4.6.2, there were significant differences between the clusters in their academic self-concept, and their perceptions of home environment and classroom climate at each point in time. In addition, they had different trends in terms of their academic self-concept, and their perceptions of home environment and classroom climate over time. Nonetheless, their academic self-concept, and their perceptions of home environment and classroom climate declined significantly in most cases for the overall 3-year period.

The aforementioned finding is indeed important, as it affirms that the developmental declines documented for the overall sample are real changes experienced by most students (see Section 4.1.1, 4.2.1. and 4.3.1). In view of the congruence of findings, it is perhaps no longer a question of whether students' academic self-concept, and their perceptions of home environment and classroom climate decline from early to middle adolescence in Singapore, but rather the extent of these declines, and the conditions under which the declines occur.

It will be recalled that the developmental trends of the clusters were such that they could be classified as the steeply decreasing, consistently low, moderate and decreasing, and consistently high clusters. Specifically, the steeply decreasing cluster (cluster 1) had students with very high academic self-concept, and very positive perceptions of home environment and classroom climate at the beginning of Secondary 1, which were indistinguishable from the consistently high cluster. However, as they entered mid-adolescence, their academic self-concept, and their perceptions of home environment and classroom climate took a dramatic, continuous dive. The declines were so pronounced that in most cases, they were significantly more than that of the other clusters from Secondary 1 to Secondary 3. In fact, their academic self-concept, and their perceptions of home environment and classroom climate were below the norm of the overall group by the end of Secondary 2. In view of the depressing picture, it is noteworthy that there were significantly more Express students in this cluster than the other clusters. In addition, the cluster also had the highest mean for PSLE result, albeit not significantly different from that of the other clusters.

The depressing picture established by the steeply declining cluster may be explicable from two perspectives. The first perspective is that adolescence was indeed a period of 'storm and stress' for this group of students (Hall, 1904). Nonetheless, the contention is only tenable if the dramatic declines in their academic self-concept, and their perceptions of home environment and classroom climate from Secondary 1 to Secondary 3 were not preceded by equally pronounced fluctuation prior to Secondary 1. If they were, then the difficulties faced by the students would be more general, and not related specifically to adolescence. In view of the fact that the cluster had significantly more Express students than other clusters, and that higher-ability classroom climate is generally more pressurising and stressful, it is also conceivable that the declines could be related to long-term difficulties in adjusting to secondary schools. For instance, the students could have problems coping with the increased academic demands, or adjusting to the more evaluative and competitive classroom climate. Alternatively, they could have difficulties accepting the more distant student-teacher relationships, or establishing themselves in the larger comparison group.

The consistently low cluster (cluster 2) painted an equally depressing picture in which the students' academic self-concept, and their perceptions of home environment and classroom climate were always extremely low. They were largely significantly lower than that of the other clusters. In addition, they declined significantly with time. In most cases, the declines were only less pronounced than that of the steeply decreasing cluster. In view of the results, it is noteworthy that the students in the cluster did not have the worst PSLE results, or Secondary 1 and 2 class positions. Their Secondary 1 and 2 class positions were only significantly lower than that of the consistently high cluster.

The results of the consistently low cluster show that the students, in addition to having devastatingly low academic self-concept, had problems with their home and school environments. Essentially, the students had difficulties with some of the most significant people in their life, namely, their parents, teachers and peers. Although not conclusive, there is evidence to suggest that the students' perception of home environment may be more negative, as compared to the norm, than their academic self-concept or their perception of classroom climate (see Figure 4.6.6). Since students' perception of one environment may be influenced by their perception of another (Paulson, Marchant & Rothlisberg, 1998), it is tenable that their perception of the classroom climate may have been affected by the extremely negative view of their home environment. However, given the extremely negative picture right from the beginning of Secondary 1, their low academic self-concept and their adverse perceptions of home environment and classroom climate possibly did not emerge at the start of the study. The problems, whether originated from the home or school, could have been there for some time. The pronounced declines during the study, however, suggest that the stresses of adolescence could have inflicted additional toll on the students.

The moderate and declining cluster (cluster 3) revealed a more promising profile. In this case, the students' academic self-concept, and their perceptions of home environment and classroom climate started slightly lower than the standardised means of the overall sample. Although they decreased significantly, they became closer to the norm over time. It is noteworthy that they were significantly more negative than that of the steeply decreasing cluster at the beginning of the study. However, towards the later part of the study, none of the differences between the two clusters reached statistical significance. There is evidence to suggest that the students' perception of home environment might be more positive, as compared to the norm, than that of their classroom climate (refer to Figure 4.6.6). In this view, it is probable that the students' relatively positive perception of home environment could have helped in stabilising their academic self-concept and their perception of classroom climate during the difficult period of adjustment to stresses of adolescence.

The consistently high cluster (cluster 4) established the most promising picture. Essentially, the students had significantly higher academic self-concept, and more positive perceptions of home environment and classroom climate than that of the consistently low cluster, and the moderate and decreasing cluster. With the exception of $time_0$, they also had significantly higher academic self-concept, and more positive perceptions of home environment and classroom climate than that of the steeply decreasing cluster. In addition, most of the declines of the students' academic self-concept, and their perceptions of home environment and classroom climate were less pronounced than that of the steeply decreasing cluster and the consistently low cluster. In view of the results, it is poignant that the cluster had the lowest mean for PSLE result, albeit not significantly different from that of the other clusters. In addition, there were significantly fewer Express students in the cluster than the steeply decreasing cluster. Nonetheless, the students had significantly better average Secondary 1 class position than the other students, and significantly better average Secondary 2 class position than the students in the steeply declining cluster and the consistently low cluster.

Despite the developmental declines, the results suggest that the students in the consistently high cluster were rather confident about their own academic abilities, and were generally satisfied with their home environment and classroom climate. In essence, these adolescents appear to be coping relatively well with the changes related to adolescence, and the effect of transition to secondary school. It is tenable that the result reflects the resiliency model proposed by Rutter (1987), who asserts that adolescents can develop skills and psychological resources necessary to cope with the stresses of adolescence. The design of the study precludes any conclusion regarding causal direction, but it is tenable that the academic achievements of the students could have been a resource that helped them cope with the problems they experienced during the first three years of their secondary education.

From the above discussion, it appears that there are unique groups of students in Singapore secondary schools. Some students may have difficulties in adjusting to changes in adolescence; others may have struggled to cope long before they reach adolescence. Some students may face minor 'hiccups' during adjustments; others may be well-adjusted and may cope brilliantly on their own. In essence, the results of the cluster analysis highlight that the notion of 'one program fits all' may no longer be relevant. Presumably, educators and teachers should perhaps tailor their pastoral care or personal development programmes to meet the needs of these heterogeneous groups of students.

It is interesting to note that Hirsch and DuBois (1991) and Zimmerman et al. (1997) also documented four distinct clusters in their studies of students' self-esteem. Specifically, the earlier study of Grades 6 to 8 students (N = 128) identified a steeply decreasing, chronically low, small increase and consistently high clusters. The latter study of Grades 6 to 10 students (N = 1160) identified a steadily decreasing, consistently low, moderate and rising, and consistently high clusters. Nonetheless, both studies examined general self-esteem instead of academic self-concept so they are not directly comparable with the present study.

To conclude, for **research question 6(b)(i)** (Section 2.8), the result affirms that there are significant developmental changes in students' academic self-concept, home environment and classroom climate, as wholes or in specific areas, from Secondary 1 to Secondary 3, in the different clusters. Likewise, for **research question 6(b)(ii),** there are significant differences between clusters in terms of students' academic self-concept, and their perceived home environment and classroom climate, as wholes or in specific areas, in Secondary 1, 2 and 3. Finally, for **research question 6(b)(iii),** there are also significant differences between clusters in terms of the changes in students' academic self-concept, and their perceived home environment and classroom climate, as wholes or in specific areas, from Secondary 1 to Secondary 3.

5.7 Main Findings of the Study

The findings of the study are numerous and diverse. Amongst them, some of the more important findings are:

- Students' academic self-concept, and their perceptions of home environment and classroom climate tend to decline from early to middle adolescence (refer to Section 4.1 to Section 4.3).

- Students appear to fall into four distinct groups in terms of the developmental trends of their academic self-concept, and their perceptions of home environment and classroom climate. The basic groups are students with steeply decreasing, consistently low, moderate and decreasing, and consistently high developmental trends from early to middle adolescence (refer to Section 4.6.2).

- The declines in Express and Lower Express students' academic self-concept, and their perceptions of home environment and classroom climate are generally more drastic than that of their Normal counterparts (refer to Sections 4.1 to 4.3).

- Normal and Higher Normal students' academic self-concept and their perception of classroom climate tend to be more negative than their Express counterparts immediately after streaming. However, they tend to be comparable if not more positive than that of their Express counterparts three years after being streamed (refer to Sections 4.1 and 4.3).

- The negative impact of streaming on students' academic self-concept tends to be more pronounced for female students than male students immediately after streaming (refer to Section 4.1).

- Higher Normal students tend to have more negative perception of their relationship with parents than Lower Express students immediately after streaming (refer to Section 4.2).

- Higher Express students tend to have more negative perception of their classroom climate as compared to the rest of the students during the first two years of their secondary education (refer to Section 4.6.1).

- Students' perceptions of home environment and classroom climate contribute significantly and substantially to their academic self-concept. The contributions are much more than that explained by non-environmental variables such as stream membership, gender, socio-economic status, or academic results (refer to Section 4.5).

- Aspects of home environment and classroom climate tend to have differential impact on higher- and lower-ability stream students' academic self-concept (refer to Sections 4.5.3 and 4.5.4). For instance, perceived parental academic support tends to affect Express and Lower Express students' academic self-concept more than that of their Normal counterparts. Perceived teachers' expectations tend to affect Normal students' confidence level more than that of their Express counterparts. In addition, perceived relationships with parents tend to affect Higher Normal students' academic self-concept more than that of any other subgroups of students.

- Aspects of home environment and classroom climate also tend to have differential influence on male and female students' academic self-concept (refer to Section 4.5.2). For instance, perceived teachers' expectations and relationship with parents tend to affect male students' academic self-concept more than that of female students, whilst perceived relationship with teachers and academic support tend to affect female students' academic self-concept more than that of male students.

5.8 Implications for Singapore

As noted in Section 5.7, the results establish that students' academic self-concept and their perceptions of home environment and classroom climate tend to decline significantly from early to middle adolescence. To a large extent, the finding may be rationalised by unavoidable difficulties associated with adolescence, such as physiological changes, their strive for physical and psychological autonomy (Dacey & Kenny, 1997), and the renegotiations of boundaries and mutual needs in new adolescent-parent relationships (Laursen, 1995). Nonetheless, it underlines that there may be difficulties inherent in the Singapore's education system that are not conducive for the growth of students' academic self-concept, or for the development of personal student-student and student-teacher relationships. In particular, students' academic self-concept and their perception of classroom climate may be undermined by difficulties related to transition from primary to secondary schools, such as less personal student-teacher relationships, lack of social recognition, and difficulties in coping with the heavier academic workload. They may also be affected by difficulties associated with heightened emphasis on academic grades with increasing grade levels, and the competitive and evaluative classroom climate of higher-ability stream classes.

In the Singapore context, the aforementioned finding has important implications for policy makers, principals and teachers. At the national level, it suggests that the MOE's recent decisions to implement single-session schools by the end of year 2000, and the content reduction of curriculum from January 1999 may be moves in the right direction. However, it also highlights the need for the MOE to take a closer look at the effectiveness of its pastoral care programme.

Essentially, single-session schools have the benefit of having more time and space to allow schools to plan for more informal, out-of-classroom activities (MOE, 1986). This will provide more opportunities for student-student and student-teacher interactions, and more chances to nurture student leaderships. As such, it has the potential to enhance the quality of school life, and to address the issues of less personal student-teacher relationships and lack of social recognition for students.

The decision for content reduction in curriculum has been taken by the MOE to provide room for teachers to implement key initiatives announced in 1997. The key initiatives are the infusion of thinking skills, integration of Information Technology in lessons, and the delivery of the National Education messages (MOE, 1998a). Although the decision did not target the highlighted difficulties directly, a 30% content reduction in most subjects will provide teachers with the flexibility to plan and space out lessons according to the needs of students. It will also provide more time for teacher-student interactions in the classroom. In this view, the reduction of curriculum may indirectly ease students' difficulties in coping with academic workload, especially for students in the higher-ability stream. It may also mitigate the problem of less personal relationships with teachers.

With regard to the pastoral care programme, the idea was mooted in Singapore in the late 1980s. It was conceived to ensure the total development of students, especially in the areas of social and moral development (MOE, 1987). There is no doubt that the programme has contributed greatly to the affective aspects of education in the past decade. However, the present findings suggest that the programme may require revision in order to address some of the pressing difficulties faced by the present generation of students. Particularly, the programme should pay more emphasis on enhancing students' academic self-concept and their general feeling of self-worth. In addition, Secondary 1 students should be given extra guidance to help them cope with the bigger social environment, and the increase in academic workload. Higher-ability stream students should also be given extra support to help them cope with the heightened emphasis on academic grades, as well as their highly evaluative and competitive classroom climate.

At the school level, the aforementioned finding draws attention to the importance of a well-planned, comprehensive co-curricular programme. It also underlines the need for more student support programme, such as mentor schemes, to minimise the decline in students' academic self-concept and their perception of classroom climate over time.

In most schools, co-curricular programme includes school functions such as Teachers' Day Celebration or Sports Day, annual programmes such as orientation or leadership training camp, compulsory extra-curricular activities (ECA) such as uniform groups, clubs and societies or sports, as well as other ad hoc activities. In view of the finding of the present study, it is pertinent that schools implement a well-planned, comprehensive co-curricular programme that is capable of addressing some of the inherent difficulties in the education system. Essentially, the programme should provide ample chances for leadership, as well as opportunities for students to interact with their peers and teachers outside curriculum time. In addition, it should aim to introduce an orientation programme that helps alleviate the difficulties of transition from primary to secondary schools for Secondary 1 students. Within the constraints of time and space for double-session schools, such a programme may be the schools' answer to minimise the decline in students' academic self-concept and their perception of classroom climate.

Mentor schemes are not common in secondary schools in Singapore. Nonetheless, it has been implemented successfully in some independent schools. In one particular school, for example, the scheme is used to address the needs of foreign students. In the scheme, approximately 10 foreign students are assigned to a teacher mentor who meets regularly with the students in casual sharing sessions to find out how they are coping with school life and life in a foreign country. The mentor becomes an important source of support and guidance for the students who are usually living away from their parents. The students also form close friendships with other members of the group, which provide them with vital support to cope with difficulties they face in the new environment and the trying period of adolescence. Such a mentor scheme, albeit with some modifications, may be a feasible way forward for schools interested in addressing the decline in students' academic self-concept and their perception of classroom climate. It can provide much needed support for students, as well as opportunities for the development of personal student-student and student-teacher relationships. However, there is a constraint of manpower in schools, so it may not be possible to operate such a scheme schoolwide. One possibility may be to channel valuable resources to the most at-risk groups of students. On a large scale, some schools may benefit from focusing on Secondary 1 students to help them cope with difficulties related to the transition to secondary schools. Other schools may want to concentrate on Secondary 4 higher-ability stream students to help them handle the stress of the looming GCE 'O' level examination. On a smaller scale, some schools may benefit from introducing short-term mentor scheme for specific target groups, such as for the lower-ability stream students immediately after they are streamed.

It will be recalled that the cluster analysis established distinct groups of students in terms of the developmental changes in their academic self-concept, and their perceptions of home environment and classroom climate. The four basic groups are students with steeply decreasing, consistently low, moderate and decreasing, and consistently high developmental trends. Clearly, the finding implies that the notion of 'one programme fits all' is perhaps no longer relevant for today's students. In an ideal situation, the solution would be to devise different pastoral care programmes to meet the needs of these heterogeneous groups of students. However, such an arrangement would be a logistic nightmare in terms of timetable and allocation of resources. Considering the constraints of schools, a more appropriate solution may be to implement some form of mentor schemes in which teachers work with smaller groups with specific needs. If resources are scarce, schools may want to focus on more vulnerable groups of students such as the consistently low or steeply decreasing group.

Although not conclusive, the findings of this study highlight the possibility of identifying some of these vulnerable groups of students. For instance, the consistently low group may be identified with the use of a questionnaire survey at the beginning of Secondary 1. It is important to note that for this group of students, mentors will have to find out about the underlying problems that cause the students to have such negative evaluations of their academic abilities, their home environment and classroom climate. They may then be in a position to support the students in accepting things that they cannot change, such as bereavement or parents' divorce, and guide them in changing things that they can, such as problems with bullying, street gangs, or conflicts with family members. In certain cases, mentors may have to work with trained counsellors.

In comparison to the consistently low group, the identification of the steeply decreasing group is less straightforward. From the findings, we know that the group tends to consist of Express students with good PSLE results. At this stage, not enough is known about the group for the students to be identified before the drastic declines of their academic self-concept, and their perceptions of home environment and classroom climate. Thus, a possible solution is to select these students with the help of questionnaire surveys at the beginning and end of Secondary 1, and try to remediate the situation after the declines have started. The reactive approach may not be ideal. Nonetheless, it is tenable that mentors will be able to do much to redress the situation if the underlying problem of the students is related to difficulties in coping with increased academic demands, or adjusting to the intensive and evaluative environment of Express classes.

As highlighted in Section 5.7, the results did not depict streaming to be as detrimental as has been reported in some of the reviewed studies. Although there were significant stream effects on students' academic self-concept and their perception of classroom climate, they were primarily short-termed. In fact, three years after being streamed, the Normal students had comparable if not more positive academic self-concept and perception of classroom climate than their Express counterparts. The findings provide support for the BFLPE (Marsh & Parker, 1984), and they appear to uphold the postulation that streaming students into more homogeneous classes may have a beneficial effect, particularly for the less academically inclined students, who may have limited chance of experiencing success in unstreamed classes.

In the Singapore context, the aforementioned findings suggest that the implementation of streaming may be a strategic move. Besides being efficient in lowering the attrition rates and in increasing the percentage of passes in the GCE 'O' or 'N' level examinations (see Section 1.2), streaming seems to give both Express and Normal students a chance to complete their secondary education. It also gives the less academically inclined students a chance to 'face the future with confidence'

(MOE, 1987), or at least with as much confidence as their more academically inclined peers. In addition, the absence of long-term negative stigmatisation effect of streaming suggests that the MOE has been successful in its efforts to educate the public and the teaching profession about the objectives of streaming. It appears that streaming is now accepted more as a mean of allowing students to progress at a pace most beneficial to them and at a level best suited to their learning abilities, rather than a selection procedure that limits their learning opportunities and restricts their career paths.

It will be recalled that the students' perceptions of their home and school environment contributed more to the variances in their academic self-concept than demographic variables such as stream membership, gender, socio-economic status, or students' past academic results. Fundamentally, this finding implies that Singaporean students' academic self-concept may be enhanced by positive regard and interactions from parents, teachers and peers. Nonetheless, it highlights that their academic self-concept can also be debased by a lack of regard or negative interactions with their significant others. Thus, parents or teachers who are interested in developing positive self-concept in their children or students cannot afford to disregard their influence on them.

Rather interestingly, the results of the study also revealed that aspects of the home environment and classroom climate may have a differential impact on the academic self-concept of different subgroups of students. In view of the findings, it may be relevant for teachers to know that lower-ability stream students' academic confidence is highly dependent on their perception of teachers' expectations, perhaps more so than their higher-ability stream counterparts. Therefore, if teachers are keen in improving Normal students' level of confidence, they need to have realistic expectations of academic performance from them. As Burns (1982) has highlighted, expectations represent a teacher's beliefs in his or her students' academic competence and abilities. When established at a reasonable level, they serve as votes of confidence that encourage the growth of self-concept. However, when established at too low a level, they convey the message that the teacher does not care, and will result in no achievement and undermining of self-concept (Lawrence, 1988). In such view, it is imperative that teachers strive to assess Normal students individually so that they convey expectations that are in line with their abilities and not their stream memberships. In essence, students, regardless of stream, should never be left with a sense of inadequacy and failure with too high an expectation. But, at the same time, they should not be left with the feeling that they are beyond help and there is no cause for any hard work with too low an expectation.

Furthermore, it may be pertinent for teachers to be aware that in coeducational settings, male students' academic self-concept may be more dependent on perceived teachers' expectations than on perceived relationship with teachers. In contrast, female students' academic self-concept may be more contingent upon perceived relationship with teachers than on perceived teachers' expectations. On the basis of the findings, teachers may want to re-evaluate the strategies they use to motivate their students. Presumably, it may be more appropriate for teachers to challenge male students to greater academic excellence by conveying high but attainable expectations, whilst it may be more effective for teachers to influence female students by providing a supportive classroom climate, typified by warmth and personal student-teacher relationships.

Finally, in addition to the influence of the school environment, the results affirm that home environment also plays a vital role in shaping students' academic self-concept. Thus, it is important that schools should work in close collaboration with parents, not only in raising the academic achievements of the students, but also in enhancing students' general sense of self-worth. Considering that aspects of home environment may have differential impact on the academic self-concept of different subgroups of students, it is relevant that schools alert parents to the needs of their children. In particular, parents should be made aware of the importance of parental academic support on their daughters, and on their children in the Express stream. In addition, they should be made to realise the potential impact adolescent-parent relationships can have on their children in the Normal stream, particularly, those who just failed to make it to the Express stream, that is, the Higher Normal students.

5.9 Implications for Theory and Future Research

In addition to having implications for Singapore, the findings of this study also have more general implications for theory and future research. Essentially, they confirm the importance of perceived home and classroom environments as predictors of students' academic self-concept, and they extend our understanding of social comparison in a streamed setting. Moreover, they underline the futility of a quest for a global model of adolescent development, and they highlight possible directions for other future research. Each of these four points will be discussed as follows:

(a) Predictors of academic self-concept

It has been reiterated many times that students' perceived aspects of home and classroom environments were found to be important predictors of their academic self-concept in this study. In particular, their perceptions of relationship with parents, parental academic support, relationship with teachers and teachers' expectation were prominent and consistent predictors of their academic self-concept, more so than their stream membership, gender, socio-economic status or even academic achievement. This finding affirms that academic self-concept, similar to general self-concept, is in part a 'social' construct, and that in line with the symbolic interactionists' postulation (Cooley, 1912; Mead, 1934), students' level of perceived academic competence can be defined by their perceptions of reflected appraisals from their significant others. This confirmation is significant in that most studies in psychology have generally centred on Western countries and it has always been assumed that whatever is relevant in Western societies would be relevant to Eastern countries. In this case, the finding is able to substantiate the fact that indeed the theory holds in the Singapore context, with its unique blend of 'East meet West' culture.

Perhaps more important than merely confirming the importance of reflected appraisals from significant others, the present investigation extended our understanding by providing a discriminate picture of the predictors of academic self-concept for different subgroups of students. In essence, the findings show that different aspects of home and classroom environments may have differential impact on the perceived level of academic competence for different students. For instance, Higher Normal students' academic self-concept appears to be more contingent on their perceived relationship with parents than the average Normal students, or their counterparts in the Express stream. In particular, their perceived relationship with parents immediately after the streaming process seems to have an undiminished impact on their academic self-concept three years after streaming. Indeed the impact even overshadows that of their latest perceptions of home and classroom environments. Furthermore, it appears that female students' academic self-concept may be more dependent on their perceived parental academic support and relationship with teachers than male students. Whilst male students' academic self-concept may be more contingent upon their perceived relationship with parents and teachers' expectations as compared to female students. In the light of the findings, it is tenable that the antecedents of academic self-concept may not be the same for different subsets of students, and that the construct may not be defined in the same way by students' perceived reflected appraisals. As such, it is important that future research should explore the possibility of group differences in any study of academic self-concept, regardless of whether it pertains to just its antecedents or more in-depth investigation involving path analysis or causal modelling.

Taft (1977, p. 130) noted that 'culture ... shapes the individual's way of dealing with his perceptual world and provides such cognitive structures as schemata, concepts, categories, stereotypes, expectations, attributions, subjective probabilities, associations and images.' Although not explored in the present study, this view is substantiated by the work of Markus and Kitayama (1991, 1994) which documented cultural differences in individuals' self-perceptions and achievement motivation. In addition, it is supported by extensive studies of Triandis and his colleagues (1986, 1993) which established cultural differences in individuals' attitudes towards individualism-collectivism. Along a similar vein, culture also plays a part in the socialising experience of its adolescents. For instance, Arnett (1992) found that in smaller societies, usually pre-industrial, in which neighbours know each other, the socialising experience of adolescents is typically that of narrow socialisation, which is characterised by firm expectations of, and restrictions on personal behaviour. In such societies, family, community and peers (and even mass media) tend to act together to produce conformity in behaviour at the risk of reducing independence and creativity. In comparison, in modern Western societies, the socialising experience of adolescents is generally that of broad socialisation, which is characterised by few personal restrictions, and more expectations of self-expression and autonomy.

Considering that culture may have a potential impact on students' perceptions, beliefs and socialising experiences, there appears to be a need for more extensive cross-cultural research into how academic self-concept may be conceptualised in different societies. Presumably, social forces may shape students' understanding of what constitutes academic success and thus shape their conceptions of academic self. For instance, in a society that values performance, it is tenable that students' academic self-concept may be affected more by their stream membership or the number of GCE passes they managed to achieve. In contrast, in a society that values learning, it is likely that students' level of perceived academic competence may be contingent more upon whether their achievements surpassed what they achieved previously or whether they were able to realise their full potential. From another related perspective, cultural differences may also affect the extent to which academic self-concept is defined by perceived reflected appraisals from significant others. In other words, it may moderate the impact of perceived home and classroom environments on students' self-evaluation of academic competence. In all probability, such impact may be stronger in Singapore as compared to a typical Western society since it is a society that emphasise more on collectivist or group values rather than individualistic values. Likewise, the socialising experience of Singaporean adolescents, perhaps better seen as a blend of both narrow and broad socialisation, may also play a part in heightening the importance attached to others' approval and acceptance in their definition of academic self. At the same time, it is tenable that the differential impact of aspects of home and classroom environments on male and female students' academic self-concept may in fact be a function of the socialising experience of adolescents in Singapore rather than any general difference related to gender per se.

Finally, it will be recalled that the construct academic self-concept was operationalised in this study in terms of students' perceived level of academic competence and academic effort. As a result, male and female students had comparable overall academic self-concept even though they had different perceived level of academic competence and effort. Specifically, female students had higher level of perceived academic effort as compared to male students, whilst male students had higher level of perceived competence as compared to their female counterparts. Although far from being conclusive, this finding suggests that there may be aspects of the academic self which may be more appropriate for endorsement by one gender than the other. In addition, there may also be differences in the manner in which male and female students conceptualise their academic self. In this view, researchers may want to re-examine the way they operationalise the construct to ensure that they are not gender bias. On a more global level, they may want to explore in greater depth the content of academic self-concept so as to reach a consensus as to its composition and its organisational structure.

(b) Social comparison in a streamed setting

To a large extent, one of the most important contributions of this study is that it highlighted the complexity of the effect of streaming on students' academic self-concept, as well as their perceived appraisals from, and relationships with their significant others. In essence, it underlined that there may be both short- and long-term impact of streaming. Unlike that suggested by the opponents or proponents of streaming, it appears not to be merely a case of streaming debasing lower-ability stream students' academic self-concept due to stigmatisation, or streaming enhancing their academic self-concept as a result of a less demanding comparison group. Instead both negative and positive effects may be present at different points in time after the streaming process, possibly due to a shift in students' social comparison groups. Specifically, the findings suggest that the salience of the streaming process may have facilitated the use of between-stream comparison amongst students at the beginning of Secondary 1. Subsequently, due to the intensity and prevalence of classroom interactions and competitions, within-class comparison may be used more frequently by students as compared to between-stream comparison, which results in Normal students having comparable if not higher academic self-concept that their counterparts in the Express stream.

Despite not being conclusive, the suggestion mentioned above has important implications in terms of future direction in the study of streaming. In particular, if stream effect is to be understood, there appears to be a dire need for direct investigation into the possible shift of students' social comparison groups over time, and the role such shift may play in defining their perceived level of academic competence. In addition, in as much as social comparison is relevant to students' self-concept, it is also pertinent that research be conducted to look at moderating factors that may affect the shift in students' comparison groups. Such factors may include more general dimensions such as parents' and teachers' attitudes towards streaming, or their academic expectations of students in different ability streams. Alternatively, they may be more specific dimensions that relate to school organisation such as the number of Express and Normal classes, or the deployment of teachers. Presumably, if there is a much higher proportion of Express to Normal classes, then the salience of stream membership may be heightened. Likewise, if the deployment of teachers is such that Normal classes are taught by a group of teachers, whilst Express classes are taught by another, then the 'streaming' of teachers may also lead to constant reminders of students' stream membership. In both cases, it is likely that between-stream comparison would be more prevalent that within-class comparison, and there would be minimal if any shift in students' social comparison groups.

With regard to the aforementioned possibility of short- and long-term impact of streaming, the obvious implication for future research is that there would be a need to check for stream by grade interaction effect before any decision is made to sum the responses of students from different grade levels. Furthermore, there would also be a need to reconsider the appropriateness of looking at stream effect at only one point in time. In essence, the timing of such study may have a confounding effect on the nature and extent of any stream effect. Specifically, if a study has been conducted near the streaming process, it is tenable that a negative stream effect would be recorded due to the effect of stigmatisation. In contrast, if the study has been conducted some time after the streaming process, it is likely that either a null or positive stream effect would be documented due to a shift in students' social comparison groups.

The complexity of the effect of streaming was further underlined in this study when the findings suggest that it might have differential impact on different subgroups of students immediately after the streaming process. For instance, the impact of streaming on students' perception of relationship with parents seems to be stronger on the marginal groups, that is, Lower Express and Higher Normal students, as compared to the average Express and Normal students. Whilst, the negative impact of streaming on students' academic self-concept appears to be stronger on female students than male students. In the light of the findings, it is likely that different subgroups of students may be affected to different extent by their frame of reference. Presumably, marginal students may be more conscious of their stream membership and so are affected more by between-stream comparison than the average Express or Normal students. Likewise, female students, perhaps being more people-oriented, may be affected more by between-stream comparison as compared to their male counterparts. In any case, the findings indicate a need for future research to look beyond the use of averaged means of the overall sample and put more emphasis on disentangling stream effects that may have been masked by contrasting tendencies of different subsets of students.

Finally, it has to be noted that the stream effects, in favour of Normal and Higher Normal students, established at the end of the present study were not supported in other reviewed studies. It was suggested that they could be rationalised in part by aspects of Singapore's educational policy, in particular, the extra time given and the possibility of transfer between streams (see Sections 5.1.3 and 5.1.4). Considering that culture may have an impact on individuals' perceptions, expectations and attributions (Taft, 1977), it is nevertheless possible that the unprecedented stream effects may be reflections of cultural differences not explored in this study. For instance, in as much as achievement is a function of an individual's ability and motivation (Rogers, 1982), it is tenable that a student's level of academic self-concept after being streamed may be contingent upon his or her belief about ability. In essence, if a student is convinced that ability is fixed, that is, entity belief, then being streamed into a lower-ability stream may have a terminal effect on his or her academic self-concept, possibly in a downward spiral of low confidence, low motivation and a lack of academic success. However, if a student believes that ability will improve with training, that is, incremental belief, then he or she may be able to accept streaming in a positive light, perhaps motivated by the conviction that given enough hard work he or she would catch up with his or her friends in the higher-ability stream. Some linguists have suggested that different languages or different cultural-linguistic groups may favour one mode of belief over the other. For instance, Bloom (1981) has contended that English language, in contrast to the Chinese language, 'entifies' properties of people and things. He noted that this entification is not simply a way of expressing something, but is a reflection of a different way of thinking about it. Although still speculative, there is no reason to preclude the possibility that Singaporean or Easterners may indeed be more susceptible to the incremental belief than Westerner, thus making it easier for them to overcome the stigmatising effect of labelling. Clearly, the only way to have a conclusive answer is to have extensive cross-sectional studies that examine the effect of streaming in relation to individuals' beliefs on ability, as well as perhaps their goal orientations and causal attributions towards success or failure.

(c) A global model of adolescent development

It will be recalled that cluster analysis established four distinct subgroups of students in terms of their developmental patterns of their academic self-concept, home environment and classroom climate. The subgroups had developmental patterns that were steeply decreasing, consistently low, moderate and decreasing, or consistently high. Clearly, this finding implies that adolescents may not be a developmentally homogeneous group, and hence competing or conflicting theories of adolescence such as Hall's (1904) 'storm and stress' theory and Rutter's (1987) resiliency model may in fact all be relevant, albeit for different subsets of youth. In view of this finding, it is pertinent that future research should perhaps channel their effort towards the search of which model is more appropriate for a given subset of youth rather than for a global model of adolescent development. Such an approach will not only provide a more in-depth understanding of adolescents; it will also minimise incorrect conclusions made from over-generalisation.

In addition to the aforementioned, it is also important that future research should strive to find out more about the different subsets of students. By knowing who the students are and why they are in the different groups, policy makers and educators would be in a better position to design interventions to cater to their needs. A useful starting point for such a study would be to look at students' beliefs and attitudes that may be related to their achievement motivation, such as causal attribution for success and failure, belief of ability, feeling of control, or achievement orientation. In all probability, students in the steeply decreasing group could have a higher tendency to attribute failure to internal stable factor, that is, a lack of ability, as compared to other groups of students. Consequently, they were less well equipped to handle the evaluative and competitive climate of Express stream classes, resulting in a pronounced decline in their academic self-concept despite their impressive PSLE results. Likewise, it is also tenable that students in the consistently high group could have a higher tendency to hold incremental belief of ability as compared to other subsets of students. As such, they were able to react positively to small academic achievements, resulting in them having rather positive academic self-concept despite their poor PSLE results and the demoralising experience of being channelled into the Normal stream.

It is noteworthy that studies on resilient individuals have identified three kinds of protective factors that protect them from stress. They are family environments, support network and personality characteristics (Hauser & Bowlds, 1990). Considering that adolescence is a stressful time, especially with the difficulties of transition and streaming, it is possible that students with close relationships with family members or other adult-figures may be able to cope better because they can draw on their support as a source of psychological resource. Likewise, it is tenable that some students may have certain personality characteristics, such as self-confidence, sense of social responsibility, co-operativeness, good communication and social skills, outgoing nature, or an easy going disposition, that facilitate their adaptation to the stresses of adolescence (Dacey & Kenny, 1997). Indeed, there is evidence in this study to suggest that for the moderate and declining group, the students' relatively positive perception of their home environment could have helped in stabilising their academic-self-concept and their perception of classroom climate during the difficult period of adjustment (refer to Section 5.6.2). In contrast, for the consistently low group, the students' rather negative perception of their home environment could have exacerbated the decline of their perception of classroom climate. In the light of the finding, it is relevant that future studies should explore whether differences in students' developmental trends may be related in part to their personality characteristics and their perceptions of family environments and support network.

(d) Suggestions for other future research

The existence of a significant relationship between students' academic self-concept and their academic achievements is supported by a large body of research (Marsh et al., 1985; Muijs, 1997). Considering that Normal students may have comparable if not higher academic self-concept than their Express counterparts three years after being streamed, it appears tenable, albeit unthinkable, that they may have comparable if not better academic achievements than the Express students. Indeed to have a full understanding of the effect of streaming in the Singapore context, there is a need for studies to extend beyond looking at students' self-evaluations and assess how streaming may have affected students' academic results and their chances of pursuing higher education. One way of doing that is to use students' GCE 'O' level examination results as a basis for comparison. The advantage of that is that it is an objective measure, and is available for all Secondary 5 Normal students and Secondary 4 Express students. In order to have a clear picture of the impact of streaming, it is pertinent that the study carries out comparisons on overall sample of Express and Normal students, as well as students in the marginal groups, that is, the Lower Express and Higher Normal students.

In addition to the aforementioned, future research may want to take a closer look at students who have transferred streams. By examining students' pre- and post-transfer responses, the study would be able to shed light on the immediate impact a change in stream membership may have on students' self-evaluations of academic competence and their perceptions of home and classroom environments. Moreover, it would provide valuable insights into how students adjust from being a 'big fish in a little pond' to a 'small fish in a big pond', or vice versa. It would also give a clear picture of any shift in students' frame of reference before and after the transfer.

Finally, it will be recalled that the Higher Express students had extremely negative perception of their classroom climate in this study. Specifically, they had more negative perception of relationship with teachers and teachers' expectations as compared to other students during the first two years of their secondary education. This finding challenges the popular notion that streaming, which may be bad for students who end up in the lower-ability stream, is advantageous to those who are channelled into the higher-ability stream, especially those who are the brightest. In this case, it appears that being the 'big fish in a big pond' may not always be an enjoyable experience. From a research perspective, this finding highlights a need for future research to move beyond the preoccupation with lower-ability stream students and explore the possible implications streaming may have for the brightest students in the higher-ability stream. In particular, it suggests a need for in-depth studies to ascertain whether the negative perceptions of the brightest students in higher-ability stream classes are accurate, and if they are, the underlying reasons for the differential treatment. Presumably, the perceptions, whether accurate or otherwise, may be a result of teachers' heightened expectations for their brightest students. It is also tenable that they may be a consequence of the high-pressured competitive approach encouraged by teachers and policy makers to bring about higher attainment from the brightest students in the top stream.

5.10 Limitations of the Study

The limitations of the study are discussed as follows:

(a) Sample

The current study is confined to government, coeducational secondary schools and it is clear that the findings cannot be extrapolated to schools with distinctly different cultures, such as single-sex or mission schools. Likewise, the results will not be accurate reflections of the situations in schools with better students' intake, such as SAP or independent schools. Due to the differences in policies in different types of schools, the findings will also not be representative of schools that are government-aided, government-aided autonomous, or government autonomous. Thus, the finding of significant declines in students' academic self-concept and their perception of classroom climate in the Singapore context are not definitive. For a complete picture, it would be necessary to replicate the study in different types of schools.

In addition to the aforementioned, it has to be emphasised that the three government schools involved in this study are in the league table of top 40 schools for Normal students. Although the findings of the study should generalise to other government schools, it is possible that the picture established by the sample, especially that of the Normal students, may be more promising than in government schools not in the league table. Thus, to have a clear idea of the possible impact of streaming on Normal students, there would be a need for further comparative study involving league and non-league schools.

(b) Attrition

Although every effort was made to reduce attrition rate by making a second approach to students whom missed any of the surveys, 150 cases were still lost from the initial sample of 645 students (refer to Appendix 6). The attrition rate was relatively low considering that it was a 3-year study. Nonetheless, it has to be noted that the attrition rate for the Normal students was slightly higher than that of the Express students. In particular, the attrition rate for non-response, which included cases with response bias, missing names and students who failed to complete any of the surveys, was 18.30% for the Normal students (n=56) as compared to 6.78% for the Express students (n=23). As such, the number of Normal students, particularly those with a higher tendency for truancy, could have been under-represented in this study. To address the problem, further research should perhaps over-sample the number of Normal students needed in the study. In addition, it should also avoid scheduling any survey after students' end-of-year examination, when the truancy rate is likely to be amongst the highest.

(c) Length and timing of the study

This longitudinal study has a relatively short duration of three years. Consequently, the interpretations of age effects are limited to early to middle adolescence. This effectively ruled out the chance of validating the curvilinear age effect on students' academic self-concept documented by Lau (1990), Marsh (1989) and Marsh et al. (1985). The timing of the study also precluded the opportunity of establishing the impact of transition from primary to secondary schools on students' academic self-concept and their perceptions of home and school environments. In this view, it would be ideal if the study can be replicated over a longer period of time or over different grade levels. If the study covers grade levels from preadolescence to early adulthood, it would be able to clarify developmental trends that may change direction over time. Alternatively, if the study covers grade levels in the primary and secondary levels, it would be able to provide more definite answers to the impact of transition and/or streaming on students' academic self-concept and their perceptions of home environment and classroom climate. In particular, such a study would be able to verify whether lower-ability stream students had lower academic self-concept, and perception of classroom climate as compared to higher-ability stream students prior to streaming.

(d) Measurement issues

As noted earlier, culture may have an impact on individuals' ways of dealing with their perceptual world and may influence their cognitions, values and emotional responses (Taft, 1977). In this view, there may be concern that a measure developed in one culture may not assess the same conceptual meaning or the totality of the meaning in another culture. This is especially true for constructs such as academic self-concept, teachers' expectations or relationships with parents, teachers and peers, which are likely to have universal as well as culture-specific meanings.

In this study, the aforementioned issue had been addressed in part by the use of measures constructed with input from different sources. They included well-established instruments used extensively by researchers, culture-free instrument (Battle's Culture-Free Self-Esteem Inventories), as well as instruments which were piloted and used in Singapore or a similar culture (Quek's self-constructed questionnaire used in Singapore, as well as Marsh et al.'s SDQ and Moos and Trickett's CES used in Hong Kong). Moreover, there was also input from trained teachers and educators in Singapore. To a certain extent, such an approach allowed for the incorporation of culture-specific meanings of the constructs. At the same time, it suggested that the measures were assessing similar concepts to those of other related studies. Nonetheless, if there had been no time constraint, more could have been done to ensure that the measures are culturally comparable, at least in terms of conceptual and psychometric equivalence.

Ideally, the issue of conceptual equivalence of a measurement, that is, the degree to which cultural groups are similarly familiar with the test items and interpret them in the same way (Helms, 1992), should have been addressed during the development of the measurement. This can be done by a 2-step approach. The first step is to employ an open-ended instrument to solicit students' interpretation of a construct in two cultures, for instance Singapore and England. Thereafter, the responses obtained in the solicitation phase are used to develop two sets of fixed item questionnaires in which one half of the items is identical to both sets, whilst the other half is specific to either the Singaporean or English culture (similar to Clark, 1987). The questionnaires are then administered to students from the two countries respectively. If the distribution of scores for both the culture-specific and general dimensions of the construct is found to be similar across the Singaporean and English students, then it can be concluded that the measure has conceptual equivalence.

In comparison, the degree of psychometric equivalence of a measurement, that is, the degree to which an assessment is tapping the same construct at the same level across cultural groups (Helms, 1992), can be assessed in a more straightforward manner after the measurement has been constructed. Essentially, it only involved the administering of the instrument to two cultural groups and comparing the average scores and/or patterns of the responses via statistical indicators such as internal reliability analysis or factor patterns. If the responses to this instrument lead to culturally similar coefficients of internal reliability or equivalent factor patterns, as discerned via exploratory factor analysis or confirmatory factor analysis, then it can be assumed that cultural bias has been overcome (Helms, 1992). Psychometric equivalence can also be suggested when the associations between the measure and theoretically related constructs are similar across cultural groups (Hughes et al., 1993).

In addition to the aforementioned, there may be some reservations about the appropriateness of some items in the subscales. It will be recalled that most of the subscales comprised of items that loaded most highly on the intended dimensions. Nonetheless, there were a number of exceptions (see Appendix 10). In those cases, the items were still considered under the proposed dimensions mainly because of their content. Ideally, the items should perhaps be rephrased so that better loadings could be achieved, or they could be deleted. However, with the rephrasing of the items, there would be a need for another pilot study. Since the first survey had to be conducted immediately after the streaming process, the constraint of time precluded the option. It was possible to delete the items, but it was not done because the elimination of items would inevitably affect the reliabilities of the subscales. More importantly, considering that the items are all relevant to the respective subscales, it is possible that by deleting the items, a less discriminate picture of the actual situation would be obtained. For future investigations, the questionable items should perhaps be rephrased so that better loadings could be achieved. In addition, more items should also be added so that any elimination of items with wrong loadings or items that are not discriminating would not adversely affect the scope of the measure. Alternatively, it may be worthwhile to employ more rigorous statistical analyses, such as confirmatory factor analyses, to ascertain the validity of the subscales. Despite the cross loadings of some items, the subscales could still have an adequate fit to be deemed acceptable.

Finally, it has to be acknowledged that the self-constructed instrument used in this study was not assessed for its concurrent validity and predictive validity. This was largely due to physical and time constraints. Specifically, it was not possible to arrange for students to complete the self-constructed questionnaire and other similar test batteries, so the concurrent validity of the instrument cannot be evaluated. Likewise, within the time frame of this study, it was not possible to justify the predictive validity of the instrument by examining the correlations of the measures with other related measures, for example, academic self-concept with students' GCE 'O' level results.

(e) Data collection

The use of questionnaire as a form of data collection is undoubtedly one of the most efficient ways of obtaining a large amount of information. Nonetheless, more in-depth information could have been collected if a research strategy of triangulation had been employed. For instance, classroom observation would have given a detailed descriptive profile of classroom ethos of secondary schools in Singapore. It would have provided useful insights into the verbal and non-verbal behaviour of teachers and students, as well as the nature and frequency of their interactions. With such information, it would be possible to discern whether teachers interact in the same way with male and female students, as well as with Express and Normal students. In particular, it would be possible to comment on the accuracy of Sadker and Sadker's (1991) contention that girls may be praised more for neatness and appearance of their work, while boys are praised more for the quality of their ideas. It would also be possible to ascertain whether there are indeed more opportunities in Normal stream classrooms for student-teacher interactions, and whether Higher Express students do in fact experience less personal interactions with teachers or are subjected to more critical feedback.

On the other hand, interviews with students would have allowed for greater depth of questioning than is possible when restricted by fixed items in a questionnaire. In essence, interviewers would have the flexibility to probe, go into more depth or clear up any misunderstanding if necessary based on the students' responses. In addition, they would be able to follow up unexpected answers, or to go into the motivations of students and their reasons for responding as they do. In this view, it is apparent that interviews, if conducted properly, would have the potential to provide a 'truer' assessment of students' perceptions and beliefs (Cohen & Manion, 1980), as well as greater insights into the meanings and interpretations they attached to events and their behaviours (Hakim, 1994). They would also offer valuable information for identifying patterns of associations between students' academic self-concept and other factors not considered in the present study (Hakim, 1994).

Regrettably, both of the aforementioned approaches could not be used in this study because some principals were reluctant to sanction them. In essence, the idea of using a combination of questionnaire survey, interview and observation was put forward to the schools during negotiation for access. In two of the schools, the negotiation was held with the teachers-in-charge of the survey. They in turn had their own discussions with their principals. In the remaining school, the negotiation was held with the principal and the teacher-in-charge of the survey. The teachers and principals were all very supportive of the study and were willing to accommodate the request for four questionnaire surveys. They were however not keen on the idea of interviews and observations. In particular, some principals were concerned that they would be too disruptive and would take up too much of the students' time. Moreover, they were apprehensive about how teachers would feel with students discussing topics pertaining to student-teacher relationships and teachers' expectations. It has to be qualified, however, that there was little chance of further negotiation with the schools because of the need to conduct the first survey within the first week of term. If there had been more discussion, it is tenable that the principals' concerns could have been addressed and a compromise could have been reached.

The physical constraint highlighted earlier meant that the data collection of this study had to be conducted with the use of only self-report questionnaire. One concern of this is the issue of response set, of which two of the most common forms are acquiescence and social desirability. To a large extent, acquiescence, that is, the tendency to agree with an item regardless of its content (Kline, 1998), had been minimised in this study by having random arrangement of positive and negative items from different subscales. This arrangement 'encouraged' students to read through the items before responding, and it allowed for the identification and elimination of cases with acquiescence.

With regard to the issue of social desirability, that is, the tendency to respond to an item because it is socially desirable to do so as seen by the respondent (Kline, 1998), it had been addressed in part by assuring the students of confidentiality of their responses. They were told that the only person who would see their responses would be the researcher, who was not known to them. In addition, they were informed that the aim of the survey was to obtain their opinions and that there were no 'correct' answers. The steps taken would have reduced the tendency of social desirability but it might not have eradicated it. A better solution would be to allow the students to remain anonymous or to incorporate some form of Lie scale to the questionnaire so that the scores of the measures could be corrected for distortion. Both approaches were however not possible in this study. Essentially, students' responses could not be anonymous because of the need for follow-up. Whilst, the incorporation of a Lie scale was not feasible because the administering of the questionnaire needed almost a whole lesson. If it had been lengthened by the addition of another scale, the time needed would be more than one lesson, which would have complicated the logistic arrangement of administering the questionnaire.

In addition to the aforementioned, there may be concern that the responses from the self-report questionnaire are simply what the students say they feel or what they say their parents or teachers do (Thomas & Nelson, 1985). Considering that students' feelings or perceptions may not be accurate, it is possible that the picture obtained may not be a true reflection of the situation. In the context of this study, this appears to be the case in terms of Normal and Higher Normal students' perceptions of their classroom climate immediately after streaming. Nonetheless, it has to be emphasised that the situations were 'real' as far as the students were concerned and so were the consequences. Hence the concern should not be allowed to detract from the significance of the findings.

Furthermore, there may also be reservation that the self-report questionnaire was used on four occasions in this study. Such a multiple use of an instrument may be problematic if the respondents remember the items and their answers. In such case, it is possible that the follow-up test may be assessing what the respondents remembered of the earlier test instead of any real changes in their perceptions. The worries are, however, unwarranted in this study since the interval between the test sessions was approximately one year. The gap was sufficiently large to suggest that the effect of 'familiarity' would be negligible.

Finally, it has to be noted that this study collected information only from the students. The limitation of this is the lack of information from the students' significant others, which precluded the chance of establishing whether their perceptions of home and classroom environments were comparable to those of their parents and teachers. In addition, it restricted many of the suggested rationales in the discussion sections to mere speculations. If information had been collected from parents, either through questionnaire or interview, more conclusive answers could have been established as to whether streaming affected parents' relationships with their children. It would also shed light on the role parents might play in helping their children, especially those who were streamed into the lower-ability stream, cope with the outcome of streaming. In addition, important insights could have been gained pertaining to their views on streaming, which would provide valuable information on the possible impact of parental attitudes on children's academic self-concept and their relationships with them. Alternatively, if parents had been asked about their views on adolescence and the extent of their willingness to grant autonomy to their adolescence boys and girls, a clearer picture would have been obtained with regard to the developmental decline of students' perception of home environment and the associated gender differences. In particular, it would provide more conclusive answers as to why female adolescents' perception of relationship with parents declined more drastically from Secondary 1 to 3 as compared to male adolescents.

Along the same vein, if information had been collected from teachers, a clearer picture could have been established as to whether teachers hold differential academic and social expectations of Express and Normal students. It would also provide more definite answers as to whether their interactions with students are moderated by the students' stream membership or their gender. In addition, valuable information would have been gained if teachers were asked about their views of streaming. This could shed light on the possible confounding effect of teachers' attitudes towards streaming on students' academic self-concept, their interactions with them as well as their expectations of them.

(f) Analysis

The cluster analysis revealed that there were four distinct groups of students in terms of the developmental trends of their academic self-concept, and their perceptions of home environment and classroom climate. Although the solution was readily interpretable and had practical significance, additional tests should have been done to confirm its validity. By not doing that, we cannot preclude the possibility that the solution may not be stable over time and may be specific to the sample (Hair et al., 1998). As such, the validation of the 4-cluster solution should be a priority for any further extension of this study. The most direct way to do that is to split the sample into two groups. Each group is cluster analysed separately and the results are compared in terms of cluster profiling and cluster sizes. Alternatively, it can be achieved by applying a modified form of split sampling whereby the centroids obtained for one half of the sample, by the use of the centroid relocation method, are used to define the seed points of the other half of the sample using a non-hierarchical analysis. The cluster solutions can then be compared to assess the correspondence of the results.

5.11 Concluding Remarks

The study has sought to examine students' academic self-concept and their perceptions of home environment and classroom climate in a streamed setting. To a large extent, it has achieved its objectives and has provided answers to the research questions outlined in Section 2.8. Essentially, it has affirmed that students' academic self-concept, and their perceptions of home environment and classroom climate tend to decline significantly from Secondary 1 to Secondary 3 (average age

13 to 15) in the Singapore context. It has also established a comprehensive picture about the short- and long-term impact of streaming on Express and Normal students', as well as Lower Express and Higher Normal students' academic self-concept, and their perceptions of home environment and classroom climate. In addition, it has provided insights into the strength of the relationships between students' academic self-concept and their perceived home environment and classroom climate, and has identified a number of significant gender effects, stream effects, and marginal stream effects on the relationships. Furthermore, it has verified that the home environment and classroom climate are significant predictors of students' academic self-concept, and has revealed that aspects of the home environment and classroom climate may have differential impact on the academic self-concept of different subgroups of students. Finally, it has established that students can be characterised into four distinct groups, namely, steeply decreasing, consistently low, moderate and decreasing, and consistently high groups, in terms of the developmental trends of their academic self-concept, and their perceptions of home environment and classroom climate.

Clearly, this study has added much to our understanding of the situation in Singapore schools, and the inherent difficulties present in the education system that may not be conducive to the growth of students' academic self-concept. On a more general level, it has also extended our understanding of academic self-concept as a construct, and has reaffirmed the importance of parental regard and support, as well as teachers' regard and expectations on students' self-evaluation of academic competence. In the light of these findings, it is worth remembering that every child is equally important. Hence, it is the duty of policy makers and educators to ensure that every child, whatever his or her capability, is given every opportunity to develop to his or her fullest potential, academically, socially, as well as emotionally. Likewise, it is the responsibility of parents and teachers to constantly remind themselves that they are the ones who hold the power to enhance or debase a child's self-concept, not his or her stream membership, academic results, or socio-economic background.

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